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AUG 24 1931

ASA BULLETIN

AUGUST, 1931 NUMBER 64

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PUBLISHED MONTHLY FOR THE SUSTAINING MEMBERS OF THE AMERICAN STANDARDS ASSOCIATION, 29 WEST 39TH STREET, NEW YORK

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The Development of the American Standard Safety Code for Elevators

by

John A. Dickinson,[1] *Secretary*
ASA Sectional Committee on Elevators

A review of the research and development work of the ASA Elevator Code Committee leading to the present revision of the code

1

History of the Code

In 1919 the Subcommittee on the Protection of Industrial Workers of the American Society of Mechanical Engineers prepared a tentative draft of an elevator code. During the War the Bureau of Standards through its Safety Code Section had prepared a number of safety standards for use in navy yards, arsenals, and similar government workshops. In the preparation of a number of these standards the assistance of recognized experts in the safety field was enlisted, and following the armistice the proposal was made that perhaps such standards might be further amplified and developed for the purpose of establishing national safety standards for voluntary adoption by industry, cities, and states. As there was obviously a great need for uniform elevator regulations, this was one of the codes to be undertaken in the spring of 1919.

A tentative draft of such a code was prepared and circulated to the members of the committee, who had assisted in its preparation, for their criticism. About this time the tentative draft of the A.S.M.E. elevator code also appeared and it was quite apparent that two national standards could do nothing but create confusion and discord rather than the uniformity which was the desire of each group. Therefore, the Bureau of Standards and the A.S.M.E. combined their resources and prepared a single standard. The first edition of the code was prepared under the sponsorship of the A.S.M.E in collaboration with the Bureau of Standards. This draft was given wide publicity and was used as the basis for a number of city and state codes.

As the industry was developing quite rapidly, it became evident that periodic revisions of this code would be necessary. About this time the American Standards Association (then the American Engineering Standards Committee) included safety codes in its scope and it was decided to revise the code (1921 edition) under the procedure of this organization. As the American Institute of Architects had evidenced a considerable interest in this code and had collaborated to a considerable extent in the preparation of the first draft, it was decided to include both the A.I.A. and the Bureau of Standards as cosponsors with the A.S.M.E.

A sectional committee representing all of the groups with a major interest in the industry was formed and after a year or more of intensive work a revised draft was prepared. This draft took cognizance of increasing speeds and endeavored to set forth certain standards of performance for vitally necessary safety equipment. This edition was issued in 1925.

At the time that these safety requirements were drawn it was apparent that at best they were "intelligent guesses" of what satisfactory performance should be. The sectional committee felt that the only way to determine reasonable standards of effective performance was to conduct a series of tests to determine, first, what existing commercial equipment would do, and, second, what performance could be expected of the most carefully designed and built apparatus. This research work will be discussed at length in a later paragraph. In view of the obvious need for revision, a date was tentatively set for revision of the code of 1927. However, active work on the revision was not started until 1928 and was not completed until the fall of 1930. The sectional committee which conducted this revision was approximately the same as that which prepared the first revision of 1925.

2

Code Changes

The first revision of 1925 contained much the same material as the 1921 edition, although much of the material was rearranged in order to make the presentation somewhat more logical. New

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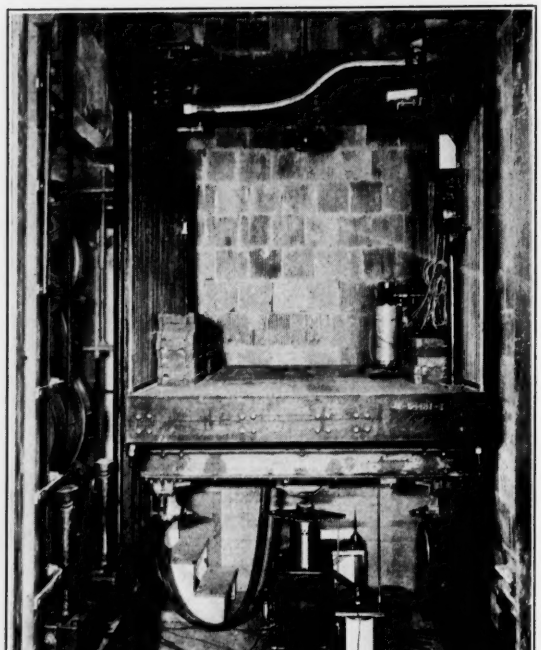

FIG. 1
View of Test Car and Pit

definitions were added and certain others revised. New material was included under safeties, terminal stopping devices, and buffers.

As the great problem in the adoption of a code of this kind is the extent to which such provisions may be made retroactive, the committee included in the 1925 edition a system of key numbers following each rule which gave the committee's recommendation for average conditions. A note indicated that the question of whether or not the rule was to be retroactive and the length of time to be allowed if a rule were to be applied to existing installations could best be left to a local committee representing the various interests primarily concerned.

The 1931 edition contains many new definitions together with a revision of some of the earlier definitions. Certain of these are not used in the code but have been inserted primarily with a view to standardizing the nomenclature. The various and confusing names applied to systems of operation and control have been segregated and these basic terms themselves defined; control being the fundamental method of accelerating, retarding, reversing, starting, and stopping the elevator, whereas operation is the means by which the control is actuated.

As the first fruit of the research work, test specifications for oil buffers are included. These specifications are based on results obtained on more than a dozen different oil buffers tested under a wide range of speeds and loads.

3

Development of the Elevator Industry during the Past Decade

During the past decade, the design and construction of elevator equipment has shown exceedingly rapid growth. When the first edition of this code was brought out, the highest speed used in any building in this country was probably that employed in the Woolworth Building—700 feet per minute; 600 or 650 feet per minute was considered extremely high speed.

Because of zoning restrictions the form of high buildings was undergoing a radical change. Buildings such as the famous "Flatiron" Building, the Equitable Building, and similar structures which arose to their full height over the entire foundation area were no longer permitted. Zoning regulations required buildings to be set back at certain definite heights so that the highest portion of the building consisted of a tower whose area was limited to not more than one-quarter of the foundation area. Such towers contain the most desirable locations and space in them commands a considerable premium. With the restricted floor area in these towers, the amount of space available for rent was not great and the space required for elevators, stairways, washrooms, etc., was a very large portion of the total area.

From a study of the economics of buildings, it was quite evident that unless the number of elevators could be decreased or the same number made to serve a larger building population, the economic height of these tower buildings would be quite limited. On the other hand, experience had indicated that even with speeds of 650 feet per minute, exceptional skill was required on the part of the operator to bring the car reasonably close to the landing under all conditions of load. It became quite evident that even though the size of brakes were increased the human equation was so great that satisfactory operation could not be obtained where the operator must be depended upon to actually stop the car at the landing. The basic reason behind this is that with a given retarding force the stopping distance of an elevator varies as the *square* of the velocity, whereas the friction brakes upon which the final stop depends (dynamic braking being employed to bring the car down from high ranges) functions approximately as the straight-line law. Quite evidently there is a point beyond which accurate landings become extremely difficult to make with car-switch operation.

Further, there is a point, which is not much in excess of 700 feet per minute, where a number on the hoistway wall or hoistway door cannot be

seen by the operator as the car passes, no matter how large this number may be. Tests have indicated that at 800 feet per minute an operator cannot read a number four feet in height when the car is passing that landing at full speed. Even though an operator can be trained to handle cars at these high speeds, frequent readjustments of car level (inching) become necessary because of variations in load, wear of brake shoes, and similar variables in the elevator performance. The amount of energy necessary to move a car one foot toward a landing will carry the same car a distance of 18 feet after it is up to running speed. In other words, the demand for power to accelerate the car and counterweight is exceedingly high. In view of all these facts, it is quite evident that the limit of speed for manual operation lies at or below 700 feet a minute.

As has been pointed out above, the economics of the tower building indicate that the minimum number of elevators will permit the highest and most economical building. Apparently, aside from difficulty in securing accurate floor stops with car-switch operation, there was no reason why elevators should not run at speeds higher than 700 feet per minute, provided a method could be devised for making the landing stops automatic. This was not a new principle as it had been applied for many years in the so-called automatic or push-button elevator. However, such elevators had generally been run at comparatively slow speeds and the mechanism employed for initiating landing stops would not be satisfactory for stops from the speeds contemplated.

New methods of operation were developed and more efficient types of control worked out so that cars could be stopped automatically at any desired floor and the car brought level with the landing threshold irrespective of load. At the same time, door-operating equipment was improved and was applied quite generally to the hoistway and car doors of these high-speed installations. Such door closers had been used in the past on a few large cars, such as those used in railroad stations and subways, but were not in general use on small or moderate sized elevators. However, it was quite evident that with power operation a small saving in time could be made at each landing and the aggregate saving in time was enough to give several additional round-trips a day or in effect to increase the carrying capacity of the elevator considerably. By the use of high running speeds, automatic floor stops, and power operation of hoistway doors and car doors and gates, it was possible to increase the number of passengers handled per car so that the number of cars could be reduced appreciably. For example, on one of the first buildings in New York to be equipped with this type of operation and control, the increase in speed from 650 feet per minute with car-switch operation to 800 feet per minute with automatic operation and power-operated doors enabled the engineer to accomplish with six elevators the service that would have required eight of the type originally contemplated. With these improvements, car speeds have mounted steadily until now 1200 feet a minute has actually been reached. Whether or not speeds can be increased beyond this depends primarily upon whether the rapid change in air pressure will prove uncomfortable to passengers in the car. Certain individuals find that the change in air pressure is unpleasant and this may be the limiting factor in elevator speeds.

New types of control have been developed, or at least brought into common use, during the past decade. At the time the 1921 edition of the code was prepared the vast majority of elevators used what was known as resistance control; that is, resistors were inserted in series with the armature and field coils (or, in the case of a-c

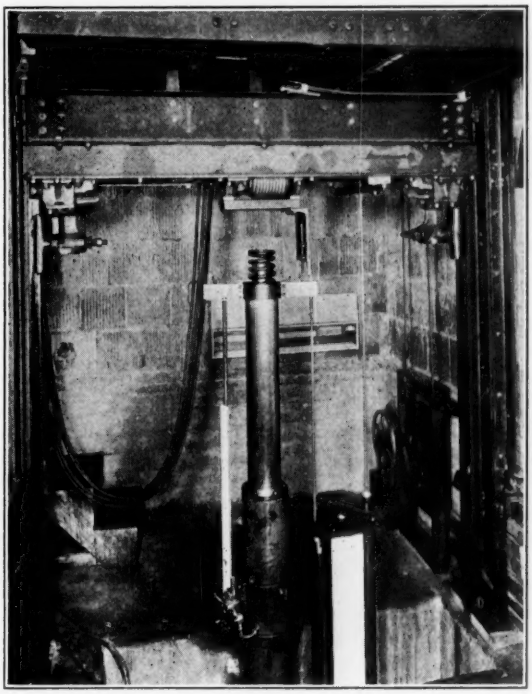

FIG. 2

View of Pit Showing Oil Buffer under Test. Long-Stroke Pressure Recorder on Left; Drum Chronograph on Right

machines, reactors were used). This method was wasteful of power, gave a series of steps to the car acceleration, and required elaborate accelerating equipment if reasonably smooth acceleration was to be obtained.

A system of multi-voltage control which had been developed and used for the control of

machines in railroad and industrial shops was modified for elevators and used for a number of installations. In this form of control a group of generators driven by a common motor gave a series of substantially fixed voltages which were successively impressed on the armature of the elevator motor. Resistance steps could be used between these voltage steps where particularly smooth acceleration was desired. This had an advantage in that power lost as heat due to resistance was considerably reduced and acceleration could be made quite smooth. One such motor-generator group could supply current for a rather large bank of elevators. This method of control was open to the objection, however, that when a part of the elevators in the bank were shut down the stand-by losses became relatively large; that is, if eight machines were supplied with current from one motor-generator group and only two elevators were running the over-all efficiency was rather poor although when all cars were running the efficiency was high.

The type almost universally employed on modern high-speed equipment is generator-field control in which a separate motor-generator set is provided for each elevator and the entire control of the elevator accomplished by increasing, decreasing, and reversing the field of the generator. The mains connecting the generator and the elevator motor are never open in normal operation. Because of the inherent characteristics of the magnetic circuit the acceleration is extremely smooth. The rheostatic losses are negligible as resistance is employed only in the field circuit of the generator, which circuit carries but a very small portion of the total current flowing. The chief objection to this form of control is the fact that if the motor-generator set is allowed to run when the car is not in actual service the energy consumption is relatively high. However, this is now being taken care of by providing time relays on the generator panel so that if the elevator does not run for a certain number of minutes the motor-generator set will automatically shut down.

Even with automatic stops, power-operated doors, and high running speeds there is an economic limit to the height of a building on a plot of given dimensions. It is quite obvious that elevator speeds cannot be increased indefinitely. The only alternative is to use the same projected area for more than one elevator. In other words, to cut down the number of hoistways in a building so as to provide more rentable space in proportion to the total area of the building or of the tower. Among the schemes suggested and in certain cases actually tried out are the following: first, the operation of two independent elevators in the same hoistway. Manifestly, this will give the maximum service of any of the possible two-car combinations. On the other hand, it is necessary to arrange the control and operating devices so that the cars cannot run toward each other except at the minimum or leveling speeds, to arrange slowdowns so that when either car approaches within a certain distance of the other it will automatically slow down. Each car must, in fact, carry, below and above, an electrical pit and overhead so that a moving elevator approaching another car either stationary or moving will slow down and ultimately stop exactly as though it were approaching one of the hoistway terminals. The question of buffers and safeties requires extremely careful consideration. Such a system has actually been worked out and is now in operation in Pittsburgh.

The second proposal is to use a double-decked car; that is, two separate and distinct cabs in a common sling, these compartments to be loaded simultaneously from two floors reached by ramps from the main entrance of the building as is the practice with the two separate cars. One of these compartments could serve the odd-numbered and the other the even-numbered floors. Obviously, both car doors should be required to be interlocked and the car operating mechanism should be arranged so that both operating devices must be actuated at the same time and in the same direction to secure motion of the car. Aside from the actual operation of the car and the proper interlocking of car doors and gates this construction does not present any particular complications, except that it implies that all floor heights in the building are identical. However, it is not as effective in point of service as the two independent cars because if we assume that each cab is to serve ten landings and the normal number of stops for a single car of the same capacity as one of the cabs is seven of those ten stops, we will find that the total stops on a double-decked car would be considerably more than seven, probably more than nine per trip. In other words, both cabs will of necessity make a stop to discharge a passenger from either of them. However, it manifestly gives far better service than a single cab operating in the same shaft area.

Another scheme which has been proposed and which has considerable merit is to provide certain express or plaza floors throughout the building and to run one or more large-capacity express elevators to each of these floors, at which floors the passengers would transfer to local elevators on the opposite side of this corridor. These locals would take the passenger to his ultimate destination much as the local subway trains collect passengers for and receive passengers from the express trains. A system of this kind with, let us say, three floors of this general nature in a building of the same foundation area could be used for three separate and distinct elevator hoistways. The difficulty in this case is the

room for hoisting engines and controllers and the space taken by pits and over-travel in the vicinity of the plaza floors.

The code has taken these possibilities into account. The 1931 revision permits double-decked cars under certain conditions and sets forth those conditions clearly. It points out the possibility of two independent cars in the same hoistway and the general provisions that will have to be made to permit reasonably safe multiple equipment. The section on thoroughfares provides that pits located over thoroughfares or working spaces must be capable of withstanding the impact of the loaded car at governor-tripping speed. This will necessitate extremely heavy construction in the pit of each of the local service elevators in the express-local system. The object of the sectional committee has been not to prevent the development of new types of equipment but to insist on reasonable safeguards where such equipment is used. It is quite probable that the next decade in the elevator art will see changes almost as revolutionary as those of the past decade. However, as the sectional committee is a continuing body it may be depended upon to draft requirements for such new types of equipment as are deemed necessary for the safety of the public.

4
Present and Prospective Progress Made in Securing Adoption of the Code

This code has been adopted by Utah, Oklahoma, and Texas, and has been made a reference standard by Iowa. It has been used in the revision of the following codes: California, Wisconsin, Pennsylvania, and New York States and the cities of New York, Baltimore, Washington, Cincinnati, and Chattanooga. In addition, it is being considered by Toledo. At the present time there are inquiries from at least a dozen municipalities and several states, and it is probable that as soon as the new edition is available it will receive consideration from a large number of jurisdictions.

5
Research

As has been indicated above, when the 1925 edition was prepared it was quite evident that performance specifications for buffers and under-car safeties could not be prepared because no one knew what performance could be expected of equipment then on the market nor did they know what performance could be obtained by devices which were carefully designed with the physical conditions in mind which they would encounter in service. Arrangements were made with the Bureau of Standards for the work to be conducted there. It was decided to make a study of safety devices with two ends in view: first, to establish performance requirements which could be inserted in the elevator code which would be practical in view of the present development of the art and at the same time afford maximum protection to the traveling public; second, to develop instruments and test procedure by which type approval tests of such equipment could be made. As the oil buffer involves fewer variables, it was decided to undertake this phase of the work first.

The physiological effects are largely a function of acceleration or retardation, so that it was necessary either to measure such forces directly or to obtain other data from which to derive these values without excessive errors. As an oil-buffer stop may be completed in somewhat less than one second, it is quite evident that instruments designed for obtaining records during the buffer stroke must be designed for the minimum possible lag. Commercial equipment used for automotive studies was not satisfactory for work of this kind. It was necessary to build special instruments with which accurate records could be obtained.

As an example of this, the long-stroke pressure recorder developed by the Fellowship might be mentioned. In the past, when pressure cards have been taken, the ordinary steam-engine indicator was used giving a card five inches or less in length. Evidently when testing a buffer with a 50-inch stroke it would be difficult to distinguish in a card a few inches in length at exactly what point in the stroke a certain change in pressure took place. Further, the inertia of the rotating parts in the indicator gave exceedingly erratic results. At high speeds the errors became excessive. The Fellowship, therefore, developed a very light platten driven by the buffer itself which carried a wax-coated card upon which the pressure recording element drew a pressure curve. This gave a card exactly the length of the buffer stroke. At the same time, all rotating parts were eliminated and the accuracy of the device greatly improved.

The work done on oil buffers which involved 12 or more representative makes and types covered a period of approximately three and one-half years and resulted in the test specifications included in the 1931 revision of the code. These specifications can be met commercially by a carefully designed buffer for a reasonable range of speeds and loads. Among the practical results of this work might be mentioned the auxiliary buffer which eliminated high pressure surges following car impact, a device which is now used commercially by at least one company and is receiving consideration from several other manufacturers. In many cases, the Research Fellow-

ship pointed out obvious defects in design or performance of specific equipment to the manufacturer. It is interesting to note that with one exception every buffer submitted for test was either a new type developed since the research work was started or resulted in the re-design of the buffer submitted.

The work on under-car safeties is now under way. Records are being taken photographically of car travel at the rate of 60 a second by means of a specially designed high-speed camera driven by a synchronous motor. The study of safeties will involve the effect of worn rails, various conditions of rail surfaces, the effect of lubricants, and the effect of wear of safety jaws. Tests have already indicated some rather interesting facts, particularly those dealing with the early part of the safety application.

This work, which has cost approximately $55,000 to date, has been financed by the elevator industry and associated interests, such as cab, door, and interlock manufacturers, manufacturers of electric motors and controllers, and cable manufacturers. Substantial contribution was also made by the casualty insurance groups.

Amendments to Constitution and Procedure Approved

The proposed amendments to the ASA Constitution, published in the May, 1931, issue of the ASA BULLETIN (page 18) have now been ratified by the Member-Bodies of the American Standards Association.

The ratification of the amendments changes the number of members on the ASA Board of Directors from nine to fifteen, which will give a larger number of Member-Bodies opportunity to become more closely associated with the direction of the Association. The amendments also provide for the election of an executive committee of the Board of Directors, to which the Board may delegate its authority *ad interim*, and outline more fully the procedure to be followed in submitting amendments to the Constitution.

Changes in the By-Laws to put into effect the enlargement of the Board of Directors also become effective with the ratification of the Constitution amendments.

In addition to the above changes in the Constitution and By-Laws, revisions to the ASA Procedure, in the nature of refinements intended to facilitate the administration of the Procedure, have just been approved by Letter-Ballot of the Standards Council.

Copies of the revised Constitution, By-Laws, and Procedure are being prepared and may be obtained from the American Standards Association.

British Standards Association Reorganized

The reorganization of the British Engineering Standards Association, which recently changed its name to the Standards Association of Great Britain, has been practically completed. The Association, originally formed for the purpose of carrying on standardization in the engineering field only, has broadened its functions to include four divisions: engineering, chemistry, building, and textiles. Each of these divisions will operate under its own council, but all of them together will be controlled by a central executive.

It is expected, according to an article in the *Mechanical World* of London, that the new organization will represent more completely the industries concerned.

The organization of the Chemical Section follows a conference of chemical interests held last year, and is the result of complete cooperation of the trade and technical bodies representing the chemical industry, headed by the Association of British Chemical Manufacturers.

It is expected that because of this difference in fundamental set-up, industrial standardization will be carried out and standards adopted to a greater extent than was possible before.

Austrian Industry Saves by Standardizing Heights of Nuts

By changing the heights of nuts from one diameter to eight-tenths diameter, the following savings have been made. Two hundred thousand tons of nuts of one diameter height had been used annually. By reducing the material of the nut one-fifth, the raw material required was reduced by 40,000 tons. Annual production costs of supplies have now been reduced from 3,750,000 marks (approximately $892,500) to 3,000,000 marks (approximately $714,000). The saving, therefore, amounts to 750,000 marks (about $178,500). The thread length saved by the reduction in the size of the nut amounts to the equivalent of 70,000 kilometers of threading in the course of a year, which would reach one and three-quarter times around the earth at the equator. It would require 69 years of machinists' work to cut this length of thread. Reckoning an average freight journey of 250 kilometers for one year's production, the saving in freight alone through the reduced height of the nut would amount to 100,000 marks (about $23,800).—*Translation of an article in the January, 1931, issue of Sparwirtschaft, a magazine dealing with economies in industry, published in Vienna, Austria.*

New Electrical Committee Will Coordinate Standards Work of Electrical Industry

Approval of the new Electrical Standards Committee by the eleven organizations which will compose the Committee was completed on July 18. The new committee, which supersedes the present Electrical Advisory Committee of the American Standards Association, will serve as a central agency in the furthering of the standardization work of the electrical industry under ASA procedure. The United States National Committee of the International Electrotechnical Commission has decided to consolidate with the Electrical Standards Committee. The Electrical Standards Committee will thus be able to begin its work with the support of all major organizations interested in electrical standardization.

This new development was initiated by the American Institute of Electrical Engineers, which, in February, 1930, transmitted to ASA certain resolutions adopted by its Board of Directors looking to the establishment of this joint agency in the electrical industry. The resolutions were accompanied by a memorandum outlining the need for a consolidation of interests in electrical standardization. This memorandum was the result of a long and careful study of the subject by Dr. L. T. Robinson, engineer of the General Electric Company, Schenectady, who had given the matter careful consideration and had studied the methods of procedure in standardization in several foreign countries. The Standards Committee of the A.I.E.E. approved the proposal, which was also approved by the Board of the Institute on the basis of the Standard Committee's recommendation.

The constitution for the ESC was developed by the Electrical Advisory Committee of the American Standards Association, the work of actually formulating the constitution being delegated by the Advisory Committee to a small subcommittee. This subcommittee consisted of Dr. Frank B. Jewett, American Telephone and Telegraph Company, chairman; C. L. Collens, Reliance Electric & Engineering Company, Cleveland, Ohio; Alexander Maxwell, National Electric Light Association, New York; and Dr. L. T. Robinson, General Electric Company, Schenectady, New York. This subcommittee held numerous meetings, and several drafts of a proposed constitution were prepared. In addition, discussions were held by the subcommittee members with many of the organizations having a large interest in electrical standardization. On May 27, 1931, the chairman of the subcommittee wrote the chairman of the Electrical Advisory Committee transmitting a constitution which the subcommittee felt was satisfactory. A meeting of the Electrical Advisory Committee to consider the constitution was held on June 2. The Advisory Committee at this meeting made a few minor changes in the constitution and unanimously voted to approve the constitution and to submit it to the American Standards Association and the United States National Committee of the International Electrotechnical Commission with recommendations for approval.

At the meeting of the Standards Council held on June 4 the recommendations of the Electrical Advisory Committee were considered and the following resolutions were adopted:

that the proposed constitution of the Electrical Standards Committee be approved;

that the proposed constitution of the Electrical Standards Committee be submitted to the Board of Directors with the recommendation that it approve the financial features involved;

that the constitution of the Electrical Standards Committee be referred to the organizations proposed for membership in the Electrical Standards Committee, with recommendations for approval and the appointment of representatives.

A meeting of the United States National Committee was held on June 3. At this meeting it was decided to circulate the proposed constitution to the constituent organizations with a request that their comments be transmitted to the secretary within a reasonable time in order that the USNC might be in a position to advise ASA.

Favorable reaction having been received from the member organizations, a meeting of the USNC was held on July 23 for further consideration of the matter. After careful discussion, the following resolutions in respect to the Electrical Standards Committee and its constitution were adopted:

that the United States National Committee of the International Electrotechnical Commission recommends the amendment of paragraph (a), Section 15, as follows:

Add a new Clause II, to read: "Three representatives of the American Society of Mechanical Engineers;"

Change the present Clause II to Clause III and the present Clause III to Clause IV;

that, subject to the acceptance of the amendment to paragraph (a) of Section 15 by the various bodies concerned, the United States National Committee of the International Electrotechnical Commission approves the adoption of Section 15 of the constitution of the Electrical Standards Committee, it being understood that the present United States National Committee of the IEC shall be continued until its successor shall have been appointed.

The following organizations which are designated in the constitution of the ESC to be members have all given their approval and signified their willingness to appoint the number of members allotted to them:

Organization	*Number of Members*
American Electric Railway Association	1
American Institute of Electrical Engineers	3
American Railway Association	1
American Society for Testing Materials	1
Communication Group	1
Electric Light and Power Group	3
Fire Protection Group	1
National Electrical Manufacturers Association	3
U. S. Army	1
U. S. Navy	1
U. S. Bureau of Standards	1

Many of these organizations have already appointed their representatives and it is expected that the organization meeting of the Electrical Standards Committee will be held in the very near future.

The subcommittee of the Electrical Advisory Committee in transmitting the constitution of the ESC, commented on the constitution as follows:

The fundamental feature of this plan is the unification of the process for formulating all of the standards of national scope affecting the electrical industry. To this end all of the types of procedure recognized by the ASA, and all of the powers appropriate for the formulation of standards, have been concentrated in one body. Ideally it might have been desirable that no sponsorships for electrical standards should exist outside of this body, but since practice and historical development, especially for the electrical codes, has identified some sponsors with their standards in a special degree, it is not proposed to disturb these relations, and ample provision has been made for their continuance. Since it is the definite desire of influential electrical bodies that review, approval and promulgation shall be with the ASA, and that the making of standards shall be done by the proposed body or other suitable sponsors, this relation has been scrupulously preserved. It is provided that the Electrical Standards Committee shall continue as an advisory committee to the ASA and also that it shall, as a standards-making organization, have available for its use all of the various procedures set up by the ASA for that purpose.

The membership proposed for the Electrical Standards Committee is designed to include the organizations that effectually represent the electrical industry, with due regard for a limitation of numbers to keep the committee efficient. In the cases where other elements, less completely identified with the entire industry, have a valid claim to representation in relation to a particular project resort may be had to joint sponsorships, the conventional type of sectional committee, or any other procedure suitable to protect the interests of the element concerned, as contemplated in the ASA constitution and rules of procedure.

It has been provided that financial support and secretarial services shall be supplied by the ASA. This is in deference to the views of many members that all standardizing activities and the expenses incident thereto should be concentrated in a single organization. The solicitation of separate financial support, and the erection of a separate staff, would certainly not be tolerated by the industry. It should be realized, however, that secretarial and related services may amount to a considerable sum, especially as it is proposed to print and publish standards, and appropriate provision should be made in the ASA budget when this plan is accepted.

In view of the pronounced desire among interested trade associations that international standardizing activities shall be conducted through the same channels as all other standardization, for simplicity and economy in administration, financial support, and personnel, provision has been made that the ESC, with certain members added for this purpose only, shall become the U. S. National Committee of the IEC. All desirable objects have been provided for in the recommended constitution. A single channel with the attendant simplicity and economy of committee structure has been provided. The established continuity of U. S. contact with the IEC is preserved unbroken although under new auspices, since this is a merger and no functioning organization is abolished. Provision has been made for continuity of the services of individuals especially identified wth the work of the IEC whereby the traditions and intangible values of this work will be preserved.

The essence of the plan is that the USNC will be employed to conduct, as an agent, the inter-

national business of the ESC with the IEC and the USNC will not use machinery of its own for the ascertainment or formulation of American opinion. The IEC is a body actually functioning in the field of international standardization and the USNC is at present an independent going concern. This makes the assent of the USNC necessary for the complete functioning of the new plan. Some difficulty appears from the circumstance that the IEC and its U. S. Committee are dealing with some mechanical subjects of direct interest to bodies that are not to be members of the ESC, notably the A.S.M.E. It is possible to make suitable arrangements to provide representation for such bodies on the projects in which they are particularly interested and it is assumed as a matter of course that this will be done. An ideal solution would consist in the formation of a mechanical standards committee comparable to the ESC to which the ESC could refer such subjects.

Underwriters Publish 1931 Building Code

The National Board of Fire Underwriters has just issued the 1931, fifth completely revised, edition of their Building Code. The code is designed to provide regulations relating to the construction, alteration, repair, or removal of buildings, and to so much of the equipment as must be considered in the planning, or installed as the building operation progresses. The code urges that municipalities have an adequate and competent building inspection as well as an adequate code.

The arrangement of the code follows the plan set down by the United States Department of Commerce for the arrangement of building codes. Chapter headings include: administration, definitions, classification, general building restrictions, light and ventilation, means of egress, materials, loads and stresses, construction, safeguards during construction, fire protection and fire prevention, chimneys and flues, heat appliances and forced draft systems, theaters and other special occupancies, elevators, miscellaneous equipment, electrical control, fire extinguishing equipment, and signs and bill boards.

It is stated in the introduction to the code that

> "in the general movement for the reduction of fire losses in this country, the National Board of Fire Underwriters has for many years advocated the adoption by municipalities of building laws representative of good and safe practice in building construction."

This code contemplates the prevention of fire, and not merely protection against it.

Copies of the code may be obtained by architects, engineers, city officials, and others interested from the National Board of Fire Underwriters, 85 John Street, New York, N. Y. Single copies of the code are distributed without charge.

Standardization in 1868

"You talk of standardization," said an old-timer. "Let me tell you of a really standard bit I ran onto in the Nineties. It was a planer that had come in for repair—in 1893, I think it was. It had been built back about 1867 or '68, just after the Civil War, and the ways were of such soft iron you could scrape them with a knife.

"Well, sir, that planer needed a complete overhauling—which we proceeded to give it. A couple of weeks later I had a wire from the owner asking when we could deliver the planer. Andy, shop foreman, figured he could give it to me about Wednesday of that week, information which I promptly wired the owner. Well, Wednesday came and went—and no planer. So did Thursday, and Friday. Saturday morning I hunted up Andy for an explanation. 'Do you know what,' said he, 'that double-darned planer won't be outa here fur a week yet. When we tore her down, we chucked all her capscrews into a keg, and poured oil over 'em, just like we always do. When we started to assemble the thing again, we found that every darned capscrew was different—either wouldn't go, or went too far. They must have turned 'em screw by screw from bar stock as they needed 'em. But somebody forgot to number 'em as they went in. Now we gotta sort 'em out as we go—and you know yourself what a hell of a bunch of capscrews go into one planer!' "—*From the American Machinist, December 4, 1930.*

Bureau of Standards Publishes Bulletin on Care of the House

The United States Bureau of Standards has just issued a new bulletin entitled *Care and Repair of the House* by Vincent B. Phelan, and designated as Building and Housing Publication BH 15.

This very practical book deals with the problems of the home-owner wishing to keep his property in good repair. It takes up such matters as doors that stick, faucets that leak, painting walls and trim, renewing roofs, weatherproofing and insulating, heating, and ventilating.

Copies of this 120-page bulletin may be obtained from the ASA office at 20 cents each or from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Some Notes on the Activities of the Austrian National Standardizing Body

by

F. J. Schlink, *Contributing Editor*
ASA BULLETIN

A description of procedure and work of the Austrian standardizing body on petroleum, oils, lumber, mining equipment, and other standardization activities

The Austrian national standardizing body (Österreichischer Normenausschuss für Industrie und Gewerbe—ÖNIG) is able to function with perhaps exceptional efficiency on account of the small size of the country and the ease with which its various manufacturing plants can be put into touch with each other in the standardization committees. Among the most important work done by the Austrian body is that on general specifications for petroleum oils. This represents the completion of two years of technical work resulting finally in practically 100 per cent agreement of the representatives on the technical committee. Even prior to approval, these specifications have been successfully and rather widely applied in industry and no difficulties have developed in their use. Their application relates among other items, to steam, gas, Diesel and oil engines, and refrigerating machinery.

In standardizing roofing paper, the Austrians found it possible to reduce 11 commercial thicknesses to four standard thicknesses. Eighty per cent of production now complies with the new standard, which has proved to be so successful commercially that a non-standard product is now rather difficult to secure.

An especially successful piece of standardization work is that which the Austrians have done on lumber. Formerly supplied in 35 widths and 24 thicknesses, giving 800 cross-sections, the present development provides 25 widths and 14 thicknesses, giving 340 cross-sections.

Mining standardization work in Austria is quite active, and has been under way for about two years. The principal items under consideration are mine cars, crown drills, compressed air motor connections, ventilating air pipes, splice plates, gages of track; tools, including drills, picks, or axes, and related digging tools, and mine carpenters'adzes; handles of hammers and shovels; and eyes for insertion of the handles of common tools such as picks, adzes, etc. Thirty-two mine cars for coal, ore, and salt have now been standardized as one for the three branches together. Sixteen mine track gages have been reduced to four.

The mining committee is divided into subcommittees whose work is divided as follows: tools; cars; mine surveying and uniform symbols, abbreviations, and scales for maps.

The work on standardization for hospitals is similar to that done by the Germans. The committee is under the general direction of hospital physicians, university professors, and producers of hospital supplies.

The three committees at work on hospital questions are as follows: one on appliances used by the patient; a second on equipment, including beds, cabinets, tables, etc.; and a third on surgical instruments. A typical committee organization includes three hospital directors—all physicians—three supervisory nurses, two hospital administrative officers, and one representative of the manufacturing industry. (In the case instanced, one concern produces nearly all of the product.)

It was found unnecessary to arrange for representation of the smaller hospitals, as they are reached effectively through publication of drafts in medical journals. This procedure works very well in Austria because as in other German-speaking countries definite provision is made for a period for criticism and objection running from a minimum of two months, up to a year in especially important cases.

It was felt that the standardization of surgical instruments would be a difficult matter because of the personal preference of individual surgeons and of particular manufacturers, but it is intended to begin this work with small items on which, on account of their greater simplicity, agreement will be more easily achieved. Hypodermic needles are under examination for this purpose. They are not now made with interchangeable parts. Of bedpans several designs have been proposed as suitable bases for the new standard and one is in practical use for trial. Of the beds themselves, nine differing designs have been manufactured and put into one

hospital for study and report by the personnel. The specifications in general are made very simple in the first instance, but will be improved in their treatment of detail later on. Other items to be taken up are sheets, blankets and pillows, certain basins and bottles, silver and chinaware for the table, and washable textiles.

The representation in the Austrian committees is arranged exactly as in the ASA work—from associations and professional societies only, except in those unusual cases where no society or association exists from which representation could be delegated. The Austrian committees are usually kept small in order to facilitate their work. Ordinarily, eight to ten persons form a technical committee, and these, it is said, are found very much more effective than committees of 25 or more, as are common in other countries. A draft is developed by a working committee of three or four men. Delegates to committees are selected by the organization represented on its own initiative.

Government Represents Consumers

The consumer's interest, in the absence of special organizations representing the consumer's point of view, is usually represented by delegates from government departments.

In the Austrian work, a staff member of the ÖNIG attends all meetings. There are some 200 to 300 committee meetings annually, held in the afternoon for the sake of regularity and of facilitating other work. Committee meetings are nearly always held in Vienna. The minutes of the committee meetings are sent out by the standardization staff itself, which acts as a secretariat for all projects.

On account of the high degree of agreement which is required by the traditional practice in Austrian work, final development of the standard often comes very slowly. The authorities, however, are convinced that this is more than compensated for by the exceptional speed with which standards are translated into practice, in which respect the Austrians believe—and for this they seem to make a very good case—that their work is in the forefront of that of all European standardizing bodies.

The Austrians do not publish the preliminary or tentative standards which the Germans occasionally do (Vornormen). They have found it possible to avoid this stage by the long period of public examination and criticism which is provided. In the Austrian procedure, the conference which is called to consider the formal request made by some trade, government, or technical organization for the initiation of standardization work is actually an organization conference which develops the aims, purposes, and scope of the standardization and sets up the subcommittees to carry on the work.

The representation in the Austrian work is so complete that no formal letter ballots are necessary either in the technical committee or in the governing body. A representative of the technical committee, usually its chairman, appears before the Main Committee (the managing committee, *Vollzugsausschuss*) of ÖNIG to report on and if necessary answer questions regarding the standard which is up for approval. The most important function of the governing body is the control of the relationships of each technical committee with other committees having fields of work which may to some extent overlap, or have other interrelationships requiring coordination or provision for intercommittee conferences.

The 18 members of the Main Committee hold their positions for three years. They are elected by a plenary session of all representatives in the organization, of whom there are now about 800.

In Austria the so-called Normenprüfstelle (similar to the Board of Examination and the various "Correlating Committees" taken together, in ASA), which has control of the adoption of standards, is differently organized than in Germany. In Austria, each different standard submitted for adoption has its own approving committee (corresponding to the special committees formerly used more extensively in ASA) and the chairman of this special committee meets with the working committee which developed the standard. This chairman is a permanent officer under whom all the special committees on approval of standards are organized. He is a veteran who has been connected with the work for many years, is thoroughly informed on all details of procedure and projects, and is in the fortunate position of being able to give, without inconvenience, all the time that is required to attend the necessary meetings and to conduct needed correspondence. Under this arrangement, which provides the necessary continuity of policy and information, the system of separate committees on approval of standards is conducted in an efficient as well as expeditious manner.

German Electrical Standards Available from ASA

Sustaining-Members interested in German electrical standards may wish to review the 1931 edition of the *Vorschriftenbuch*, a publication containing all of the principle regulations and standards in electrical engineering practice issued by the German national standardizing body, as well as German standards covering operating voltages in high voltage installations, and standard regulations of the German electrical society.

The book is published by the Verbandes Deutscher Electrotechniker (VDE), the German electrical society.

Copies of the book may be borrowed from the American Standards Association. Orders will also be accepted by ASA for delivery in three weeks, price $5.50 per copy including all transportation charges.

New Underwriters' Laboratories Standards

The Underwriters' Laboratories have issued a printed edition of their Standard for Industrial Control Equipment and of the Standard for Transformers. The new edition of the Standard for Industrial Control Equipment supersedes the mimeographed edition of 1928, and the Standard for Transformers supersedes the mimeographed standards for Bell Ringing Transformers, Power Transformers, and Toy Transformers. The new editions are uniform in size and editorial arrangement with other printed standards of Underwriters' Laboratories.

Industrial control equipment is defined in the standard as the apparatus and the devices immediately accessory thereto, for starting, stopping, regulating, controlling, or protecting electric motors in industrial applications.

The standard includes a section on equipment for use in ordinary locations and a supplementary section covering equipment for use in hazardous locations as defined in Article 32 of the National Electrical Code.

The requirements which appear in the section covering equipment for use in ordinary locations are based on the requirements in the superseded edition but have been subjected to a rather complete rearrangement.

The requirements covering equipment for use in hazardous locations are published for the first time. Equipment for use in such locations is required to be designed and constructed to meet the requirements for equipment for use in ordinary locations and must also meet certain additional requirements. Air-break type equipment, for use in Class I hazardous locations, is required to be provided with an enclosure capable of withstanding the internal pressure resulting from explosions, without bursting or loosening of joints of the enclosure. Tests to demonstrate the ability of the enclosure to withstand and confine such internal explosions are specified. Oil-immersed type equipment for use in Class I hazardous locations is required to be provided with an enclosure so designed and constructed as to avoid any possibility of sparks being produced above the oil level. Tests to determine whether this feature has been complied with are prescribed.

Equipment for use in Class II locations is required to be provided with an enclosure constructed so as to exclude dust. Suitable tests are specified.

In common with other printed standards, this standard includes a brief description of the Reexamination Service applicable to this equipment.

The new edition of the Standard for Transformers includes, in addition to the requirements of the previous mimeographed standards, requirements for gas tube sign transformers and oil burner ignition transformers.

The new standard contains a section covering each class of transformer mentioned above, the power transformers, however, being referred to as air-cooled transformers.

The requirements for bell-ringing and toy transformers do not differ greatly from the requirements given in the superseded standards for these devices. There has been a reduction in the dielectric strength test and some revision of the test requirements for toy transformers. The requirements for air-cooled transformers have been considerably elaborated.

The requirements for gas tube sign and oil burner ignition transformers are published for the first time. Oil burner ignition transformers of both the high-secondary voltage type and of the low-secondary voltage constant current heater type are covered.

In general the requirements cover the design and construction of the enclosure and coils, the rating and marking, and tests to determine acceptable performance.

A final section gives a brief description of the Reexamination Service as applicable to transformers.

A.I.E.E. Recommendations for Electricity on Shipboard

The 1930 edition of the American Institute of Electrical Engineers' "Recommended Practice for Electrical Installations on Shipboard" is now available.

The pamphlet, which was originally known as "Marine Rules," has been developed under the auspices of the A.I.E.E. committee on application to marine work and in its new edition includes extensive revision of the 1927 issue, with much new material on such points as motor-operated, water-tight doors, electric brakes, radio compasses, etc. It is known as Section 45 in the Institute's Standards series, and may be borrowed from the ASA Information Service, or purchased at a cost of $1.50 per copy.

Standardizing Cylindrical Fits to Simplify Design[1]

by

John Gaillard, *Mechanical Engineer*
American Standards Association

The essential features of a standard system of fits considered from the viewpoint of the machine designer and his relation to the workshop

Specification of manufacturing limits of cylindrical parts demands expert judgment of the three main factors involved: the requirements of the manufactured product; the possibilities of the machine shop equipment; and the cost of maintaining accuracy. Fits must be designed so that the final product will function perfectly and have a reasonable life as to wear.

Important from the manufacturing point of view is the question of the manner in which the parts are to be finished. They must be held between the specified tolerance and, moreover, finished by the most economical process available for the purpose. Shall a certain hole be reamed or broached, or a shaft or pin be turned or ground? This will depend on a number of factors, such as certain details of the design, the nature of the machine equipment available, the size and shape of the parts, the size of the lots in which they are made, and the quality of the surface finish. The latter factor should not be disregarded by the designer. Too often it is assumed that only parts with close tolerances require a high quality of surface.

More recently, emphasis has been laid on the necessity of giving a good surface finish to other parts, the fit of which is not so exacting. This will prevent the rapid deterioration of surfaces caused by abrasive action of loosened particles during the running-in period. Designers therefore should specify, whenever this is desirable, the kind of a surface finish to be given the parts. Only a start has been made in analyzing the quality of surface for the purpose of establishing a standard classification, but much can be achieved in practice by referring on the drawing to samples of surface finishes identified by names or numbers. Sets of such samples should be deposited for reference in the research, engineering, production, inspection, and standards departments.

Accuracy of sizing and quality of surface are related closely to the third main factor which must be considered; i.e., production cost. This goes up rapidly with narrowing of the tolerances and refining of surface quality. Therefore, the tolerances on the parts should be the largest compatible with their satisfactory performance, and the quality of finish should be no more refined than necessary, unless the products demand a higher grade of work because they are, for instance, in the luxury class.

A number of organizations have adopted a series of standard fits of different character covering the requirements of their products. This simplifies the designer's task considerably by enabling him to select a "ready-made" fit and to use this on the drawing, designating it by a name or symbol. The latter should, of course, be tied to definite and duly recorded limits for the mating parts, otherwise difficulty will result from varying interpretation by different individuals. What the term "tight fit" or "sliding fit" means will depend in part on the effort spent on assembling the parts. One man may be able easily to slide an external part over the mating shaft; while another may not succeed in doing so, consequently calling the same fit a tight one. Therefore, numerical values for the manufacturing limits of the mating parts always should be the basis for fits specified on the drawings, whether they be indicated by the limits or by names or symbols.

Additional Requirements Imposed

When interchangeability of fits becomes a problem common to several departments of the same concern, or to different concerns whose respective products must be assembled together, the series of standard fits must answer additional requirements. In fact, fits may be identical in character while still the position of the tolerances relative to the nominal size may prevent interchangeability. This is shown by the diagrams in Figure 1, representing a running fit specified in three different ways. The cross-hatched bar represents a tolerance of 0.0012-

[1] Reprinted from the June, 1931, issue of *Machine Design*.

inch on a hole with a nominal size of one inch, while the double cross-hatched bar represents a tolerance of 0.0008-inch on the mating shaft. The allowance (minimum clearance) is the same in all cases: 0.0006-inch. Diagrams *A* and *B* each represent a system of unilateral ("one-sided") tolerances; that is, each tolerance is given from a basic size in one direction only. Diagram *C* represents the principle of bilateral ("two-sided") tolerances, the latter consisting of a permissible plus and minus variation from the basic size of the part concerned. Evidently there is no difference whatever between the way in which the three hole-shaft combinations assemble, but the fit between a hole *B* and a shaft *C* would be too loose, while the fit between a hole *C* and a shaft *B* would be too tight.

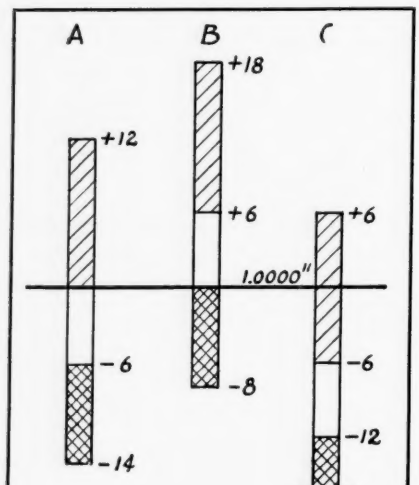

FIG. 1

Three methods of specifying the same running fits that are identical in character but in which the position of tolerances prevents interchangeability (tolerances are given in 0.0001-inch)

All modern national standard systems of fits are based on unilateral tolerances as shown in diagram *A* or *B*, Figure 1. In the former case, the minimum size of the hole is kept constant and equal to the nominal size. This applies, whatever the hole tolerance may be. In such a "basic hole system" the limits of the shaft are varied to take care of the different fits required. This principle has been adopted in a standard now under revision, approved in 1925 by the American Standards Association. The eight fits specified in this standard are shown by the diagrams in Figure 2a for mating parts with a nominal size of one inch. There is a choice between four different tolerances on a hole of a given specific nominal size. For a one-inch hole these tolerances are 0.0030, 0.0013, 0.0008, and 0.0006-inch.

In Figure 2b, a series of fits is represented which is based on the opposite principle, not incorporated in the present American Standard. In these fits the maximum size of the shaft is constant and equal to the nominal size, while the limits of the holes are varied to secure different fits. This is called the "basic shaft system." The fits in Figure 2b are identical in character with those in Figure 2a.

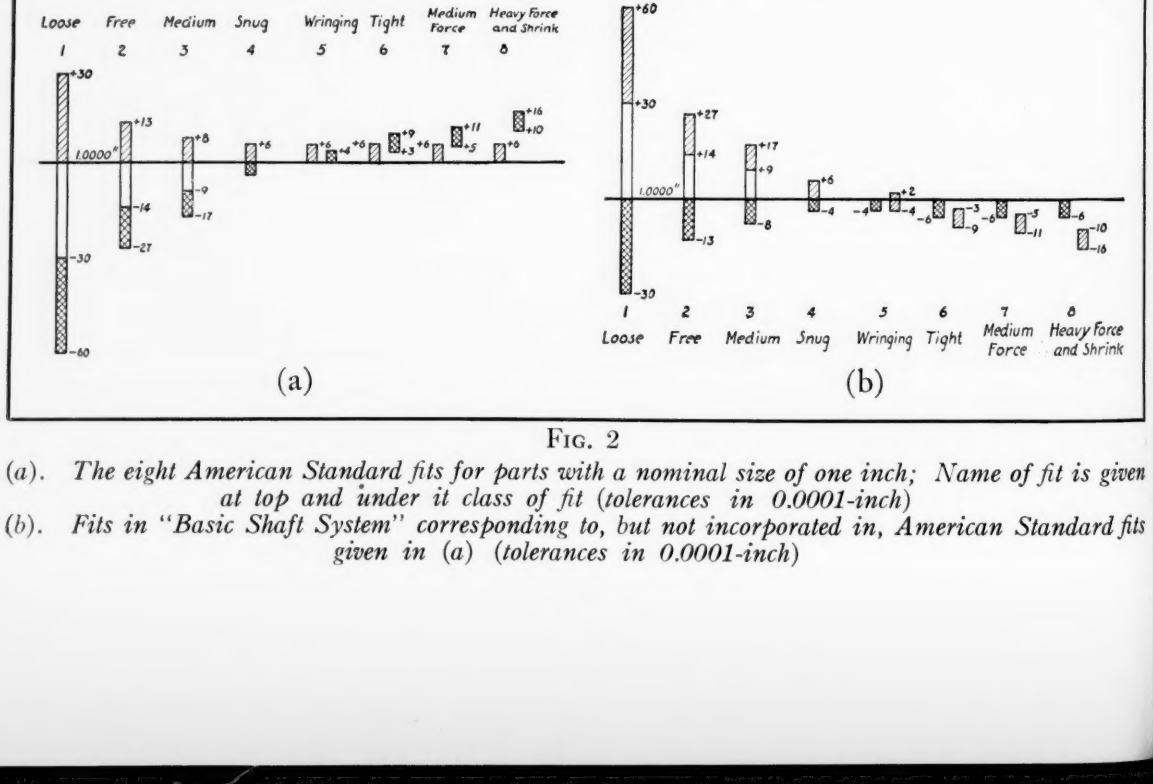

FIG. 2

(*a*). *The eight American Standard fits for parts with a nominal size of one inch; Name of fit is given at top and under it class of fit (tolerances in 0.0001-inch)*

(*b*). *Fits in "Basic Shaft System" corresponding to, but not incorporated in, American Standard fits given in (a) (tolerances in 0.0001-inch)*

Because the Basic Shaft System (Figure 2b) does not form part of the present American Standard, and fits in this system are needed by some industries, the American Standard has been criticized. This, and other criticism, and the desire to review the standard in the light of recent progress in this field, has led to its reconsideration by a technical committee organized under the procedure of the American Standards Association. This committee also will consider a proposal for international unification of standard fits now being developed under the auspices of the International Standards Association. This effort aims at the unification of the national standard systems of fits now in existence or in course of development. All of these systems are based on unilateral tolerances as shown in the diagrams of Figures 2a and 2b. While the American and the British standards give the Basic Hole System exclusively, the other ten existing national standards give both the Basic Hole and the Basic Shaft Systems. The American committee will consider the addition of the Basic Shaft System to the standard.

The existence of a national standard is an effective aid to the engineering department. Such a standard must comprise a relatively large number of fits, as it must serve the needs of the national industry at large and, therefore, must comprise fits used by concerns making widely varying products ranging from precision machine tools to farm equipment, and from cash registers to railroad cars. Not only is the designer able readily to pick a suitable fit from the national standard series, but also he is assured that such a fit is identical in every respect with that adopted by others under similar conditions.

Far more important to the designer is the fact, however, that he need not give any particular thought to the limits of the mating parts made by other concerns. Take, for example, ball bearings which are often made in large quantities without it being known for what ultimate purpose they will be used. They may go into an automobile, or a drill press, or into the roller of a gravity conveyor. Nevertheless, once the limits of the bore and the outside diameter of the bearing have been standardized,[2] every user can decide in advance on the limits to be adopted for the mating parts.

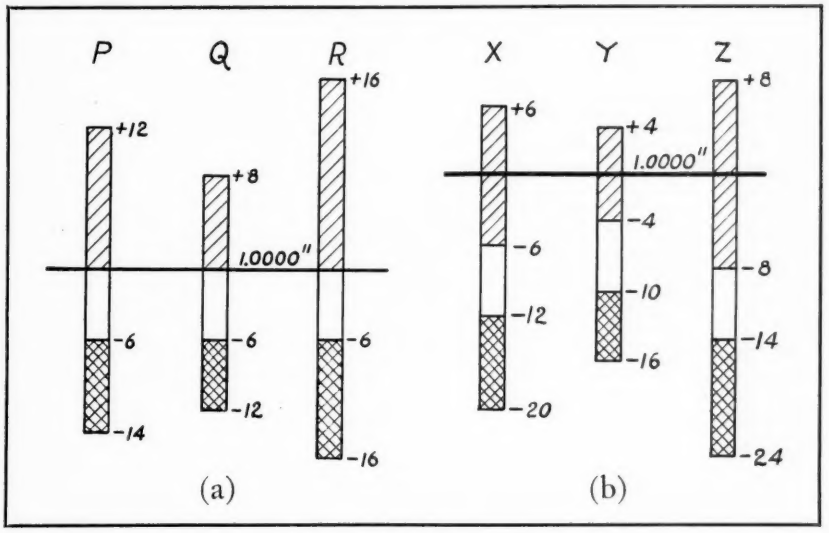

FIG. 3

(a). Limits are shown at Q and R to which tentative tolerances, P, may be altered in the unilateral system after operation has shown necessity for the change (tolerances in 0.0001-inch)

(b). More complicated adjustments are required to change tolerances in the bilateral system than in the unilateral shown in (a) (tolerances in 0.0001-inch)

From the design viewpoint the unilateral system has a decided and essential advantage over the bilateral in that the former possesses greater flexibility when tolerances must be adopted or revised, especially under the following conditions. Designing a new machine often makes it necessary to adopt the tolerances on certain parts in a tentative way, the use of the machine in actual operation having to show whether they are correct.

Tolerances Easily Adjusted

In Figure 3a, where the diagram *P* represents the original fit, the tolerances may either be reduced to those of diagrams *Q* or increased to those of diagram *R* while still maintaining acceptable fits between old holes and new shafts, and conversely. If bilateral tolerances were used, however, interchangeability between old and new conditions would be disturbed, see diagrams *X*, *Y*, and *Z*, Figure 3b. These represent the same kinds of fits as shown in diagrams

[2] The main dimensions of the current types of radial ball bearings and the tolerances on these dimensions have become a world standard through agreement between most of the industrial countries, such as the United States, Germany, Great Britain, Sweden, etc.

P, *Q*, and *R*, Figure 3a, but specified in the bilateral system.

Furthermore, a change in tolerances of the kind mentioned in the example given here, when carried out in the unilateral system, requires a change in only two manufacturing limits: the high limit of the hole and the low limit of the shaft. This is important to the designer as he may have to deal with changes in several fits on the same shaft. Matters then are greatly simplified by the fact that the two innermost of the four limits "stay put," for all of the fits concerned. An additional practical advantage is, of course, that only two, instead of four, limits have to be changed on the drawings.

The most important point in favor of the unilateral system is, however, that whatever change may be made in a fit, one limit always remains the same: the nominal size. This holds good even though the allowance and both of the tolerances of the fit be changed. The nominal size thus forms a constant reference line, and this fact materially contributes to the easy visualization by the designer while he is considering the values of the manufacturing limits. In the bilateral system, all of the four limits must be shifted with regard to the nominal size with any change in a fit, even when the tolerance on only one mating part is concerned.

Concluding, we find therefore that unilateral tolerances are in every respect preferable to bilateral tolerances in a general standard system of cylindrical fits. The unilateral system is easier to establish, to maintain, and to change. Also, it takes care in the simplest way possible of the numerous cases where parts manufactured by independent concerns or even entire branches of industry must be assembled. This viewpoint has been confirmed in practice inasmuch as all national standards now in existence—twelve altogether—and those in the making, recommend the use of unilateral tolerances. The proposal for the international system of fits now in course of development also is based on the unilateral system.

Paper Specifications and Samples Available

Standard Samples of Paper for the Public Printing and Binding for the Year Ending February 28, 1932, a book issued by the United States Government Printing Office, may be borrowed from the American Standards Association by Sustaining-Members interested in the purchase under specifications of paper or pressboard.

This book contains samples of papers used in the government service, with the specifications printed on each sample. Some of the types of paper included are: newsprint, book, mimeograph, check, writing, bond, ledger, index, manifold, parchment, cover, kraft, manila, manila board, post card bristol, gummed, blotting, pressboard, newsboard, strawboard, and binder's board.

Some of the items covered by the various specifications for different kinds of paper include: stock, ash, acidity, weight, folding endurance, bursting strength, thickness, density, coating and surface, color, finish, watermark, sizing, erasing, general appearance, and water resistance.

Only one copy of this book is available and requests will be taken care of in the order received.

A.S.T.M. Reports Published

The following committee reports have been published separately by the American Society for Testing Materials:

Report of Committee D-2 on Petroleum Products and Lubricants	$1.25
Report of Committee A-5 on Corrosion of Iron and Steel	$0.50
Report of Committee D-13 on Textile Materials	$0.80
Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete	$1.50

Copies of these committee reports may be purchased direct from the A.S.T.M. at 1315 Spruce Street, Philadelphia, or through the ASA Information Service.

The supply of copies of the Report of Committee D-9 on Electrical Insulating Materials has been exhausted but a copy may be borrowed from the ASA Information Service.

ASA Staff Personnel

The following ASA staff personnel list is published in response to requests:

Administrative and Engineering

P. G. Agnew	Secretary
Cyril Ainsworth	Assistant Secretary
John Gaillard	Mechanical Engineer
J. W. McNair	Electrical Engineer
H. M. Lawrence	Mining and Metallurgical Engineer
M. Andrade	Office Manager

ASA Bulletin and Information Service

Walter H. Cook	Promotion
Florence Fuller	Librarian
Arthur Kallet	Editor, ASA BULLETIN
Ruth E. Mason	Assistant Editor, ASA BULLETIN

A Program of Accident Prevention through Standardization of Mining Operations[1]

by

William R. Meyers[2]

A discussion of the effect of standardization of mining equipment and practices as a means of increasing the safety of mining operations

We find from time to time that accident prevention work reaches a condition where a new approach is necessary to attain further improvement. Several years ago, we awakened to the fact that the success of any safety movement was dependent on the interest of the executive. Safety in industry is now acknowledged an executive matter, due to the overwhelming evidence that a safe mine or plant is an efficient one and conversely an efficient mine or plant is a safe one. Through an executive's knowledge of the processes of the industry, his sympathy, and understanding of the problems which confront his employees, a spirit of enthusiastic cooperation and loyalty is created in those associated with him.

Industry today recognizes the interdependence of employer and employee. It realizes that the employer prospers in direct ratio to the prosperity of his employees; that maximum productivity cannot be attained until accidents are reduced to a minimum. As a means to this end of increased efficiency and a new approach to further improvement in accident prevention, I will endeavor to show the reason for standardization of operating methods, the success of which is dependent on supervision and discipline.

It has been truly said that:

> "Present day advanced safety practice in industry places the responsibility for accidents and their prevention directly upon the employer. Self protection on his part forces him to resort to intensive supervision and discipline, which, in order to make these even reasonably effective, must be supplemented by educational activities of various kinds. Of prime importance is the education of the supervisory officials, since they very obviously cannot tell their employees what to do or not to do unless they themselves know what is safe against what is unsafe in mining, including methods, practices, equipment, installation, etc."

In reducing the number of preventable accidents as in any other human activity, orderly planned, intelligent effort results in greater accomplishment than loose, slipshod, hit-or-miss methods.

If an accident occurs, does it not mean that we have done the work in an improper way? Standardization of operating methods is, therefore, an answer to this question. Almost immediately objection against standardization arises on the ground that it will retard progress or throttle the possibility of change, but when it is carried out on a practical and sound basis the contrary is true. The idea of perfection is not involved in standardization. Standard methods of operations should be simply the best methods that can be devised at the time they are adopted. The work in itself is a powerful incentive to accumulate the correct data upon which uniform requirements can best be decided. Improvements should always be wanted and adopted, whenever and wherever they are found.

Standardization with respect to equipment, installations, and other essential elements covering interchangeability between its mines has been practiced for many years by the Cleveland-Cliffs Iron Company, in the belief that it increases efficiency and produces larger economies. In recent years we have found the need for codes of safety standards to control those operations which experience has proven to be prolific sources of accidents. Unsafe methods of doing work, negligence, and indifference should be no more inherent or prevalent to the mining industry than they are in other industries, but the number of accidents that are traceable to those causes is convincing proof that ways and means should be designated to stop or to eliminate them, as much as it is possible within human skill and power. The fact that carelessness may be an underlying

[1] A paper presented at the Annual Meeting of the Lake Superior Section of the National Safety Council, June, 1930. This paper has been published in the *Lake Superior Mining Institute Proceedings* and in the *Proceedings of the Lake Superior Mining Section of the National Safety Council.*

[2] Superintendent of the Spies-Virgil, Tilden, and Holmes Mines, Cleveland-Cliffs Iron Company, Ishpeming, Michigan.

cause for many accidents does not lessen their social or economic loss, nor lighten the burden of responsibility of those who are most concerned in the work of accident prevention. The significance of the safety movement will not be understood or appreciated where doubts exist or opinions differ as to what really constitutes safe practices. Fairness, in dealing with men, demands that supervision and discipline should be directed by carefully thought-out standards of operation that will prevent the things responsible for accidents.

Analysis of Accidents

The whole purpose of analyzing and classifying accidents by causes should point to the next logical and tangible preventives. We know that many are the outcome of a long train of events, but if only complete information were available, it would be possible to trace any accident to its initiating cause—to some failure of insight or foresight on the part of some human agent, or, in many cases ultimately, to a failure on the part of the management, due to unsafe mining methods, defective equipment, faulty installation, or inadequate supervision or instruction. In prevention work, it is needful to know how and why accidents occur, and while causes are almost as varied as the circumstances which give rise to them, yet the large majority may be charged to conditions or circumstances that can be prevented. Although the field is broad and includes the experience of years, the success and permanency of the movement require that the multiplicity of operations involved in mining shall be closely associated with safety, and directed under capable supervision. It is not expected that our industry will ever be entirely free from accidents, but occupational hazards can be reduced and men must be led to give their hearty cooperation to a work that so vitally concerns them.

In attempting to arrive at standards for operating methods, it is very important that all men who hold supervisory positions shall have an opportunity to participate in their formulation. Conferences of these men, as a sponsor body for recommending standards, help to eliminate practices and customs that impede progress and lead to the getting of those facts which will inevitably increase safety and efficiency. By pooling the experience and skill of such a group of men, management shows that its policy is conducive to cordial cooperative work and assures itself of the best methods of performing its various operations. The possibilities of bettering conditions are great enough to warrant the participation of the men who know their jobs and its needs better than any others and whose services have only to be commanded. By keeping their interest and enthusiasm directed toward this work, there is developed a spirit of mutual helpfulness and coordination of effort that will produce results as fast as the need for progress in standardization demands. By basing standards upon the collective opinion of foremen, they are placed in the position of being asked to put into effect their own ideas rather than the ideas given them by others.

There are many operations in mining to which standardization can be applied, such as mining methods, transportation, explosives, mechanization, etc. In many phases of these operations, past practices covered the desired field and it is only necessary to use the combined judgment of the foremen to pick out and recommend the best. In other cases, the essential details may have to be worked out with extreme care in order to insure the greatest accuracy in operative work, combined with maximum safety. By bringing out and sorting the accumulated experience of a representative group of men, whose membership includes those who are familiar with the equipment and activities of a mine, a workable basis is laid, upon which standardization can be built without interfering with production and at the same time inestimable results toward safety will accrue.

The top slicing or the caving method of mining, which is used very extensively on the Marquette Range, has accounted for one-third of the fatal accidents over an extended period of time. It is true that natural circumstances vary from mine to mine, even within a limited area, but they should not be interpreted as meaning that well-defined safety standards cannot be made to play an important role in reducing the hazards that cause these accidents. Time and thought should be devoted in an intensive study in building up and maintaining a strong protective mat or gob, in every mine where this method is used. Physical inequalities in ore bodies and associated rocks, large dikes or horses of rock within an ore deposit, the presence of water, etc., are obstacles in the way of safe mining, and only by agreeing upon the best and safest methods of procedure and following those methods very rigidly is there promise or likelihood of success in our efforts to master the occupational hazards of this work. Attention should also be given to the unusual and little-known factors, for they may furnish information that will prove invaluable in the development of better practices.

Standardization of Transportation

It is not too much to say that standardization offers a major opportunity toward the integration of the various operations involved in underground transportation so that the system may be made to function efficiently and safely. It has been said that the haulage system "that produces the lowest cost per unit of production is one that is so well designed and installed that it is the

safest to operate." On the other hand, it is not only very essential, but possible, to make standards sufficiently complete so that all operations in connection with this work can be comparatively safe to perform. It is work that gives primary occupations for younger men, which is but another reason why the standards should be specific in their requirements and regarded as mandatory in enforcement.

The reliability, efficiency, and stability of explosives, whereby they have become comparatively safe to handle and use, bear testimony to the great progress that has been made by the manufacturers in cooperating to reduce the danger and disadvantages of mining. The millions of pounds of dynamite used annually without accident testify to the constant effort being exerted to increase safety in their usage. But while it is true that if miners will remember the nature of explosives and are careful in handling them, there will be little danger of accidents, the fact must not be forgotten that many accidents by explosives are of a fatal or serious nature and that the records of such events contain the names of experienced men. The information for the setting of standards by which men can do this work exceptionally well is not lacking, and management must use that information and force men to observe safe practices in exact keeping with an occupation that has such possibilities for death and injury as exist in the careless use of explosives.

Because mechanization is rapidly increasing at our mines does not signify that it is a factor that decreases or increases the safety of mining. It has eliminated many old hazards under hand loading but it has also brought out new hazards. It will make mining more safe only if proper precaution is used and intelligence applied in its application. As one authority states:

> "It is true that mechanization requires greater caution, greater skill, and a higher degree of intelligence from the worker. It requires training; the creation of the new term 'mechanical-mindedness,' and an adherence to standards and safety codes."

In the standardization work of the Cleveland-Cliffs Iron Company, we have been studying the following specific projects:

1. Providing and maintaining ample equipment
2. Proper installation of equipment
3. Safe mining methods
4. Safety codes for hazardous occupations
5. Uniformity in the requirements demanded of employees
6. Improved discipline

Formulating or prescribing a code of safety standards for the various operations incidental to hazardous occupations will not of itself stop accidents. It is hardly necessary for me to say in the presence of this body of men that how to reach and influence effectively the personal equation is a most important factor. In securing the highest standards of safety in operation, the cooperation of employees is absolutely essential and there must be painstaking effort to destroy as far as possible the interrelationship between safety and universal human shortcomings. Employees must not be permitted to lag behind in this movement and the responsibility for administering standards must rest with the management.

Enforcement of Standards

In the development of newer and possibly more progressive conditions and methods under which we operate our mines, modification and sympathetic consideration are being evinced by employers toward employees. Education and persuasion have brought better general results than prevailed many years ago and there has been a decided tendency toward better discipline. Infraction of rules or regulations may be excused or condoned where human effort is ignorant or misdirected, but if accidents are ever to be reduced to a minimum, men must be awakened to the realization of the fact that management's only alternative is an arbitrary action in dealing with offenders. Disciplinary leniency will not direct the serious attention of men to the object and purpose to be derived from the observance of standards. Indifference or carelessness will be a less cause of accident only when the enforcement of standards is made mandatory and accompanied with severe penalties. Our company has put the responsibility directly upon the foremen and for this added responsibility are paying them a safety bonus. Each shift boss, surface foreman, chief electrician, and mechanic, who has men working under him, in addition to his regular daily wage or salary receives a safety bonus of 35 cents per day for each two-week period in which no lost-time accident occurs to any of the men under his supervision.

In order for standardization to be effective, it must be backed up by supervision and discipline, two of the most important factors in accident prevention work. Men must first be instructed in the safe and efficient way of doing their work and then be compelled to work in that way. We must make the conduct of carelessness and indifference so discouraging and futile that there will be an abandonment of all habits and customs that endanger life. If men are unwilling to observe safe practices, we can at least deprive them of the privileges of such action by separating them from their jobs. If we do not assume this prerogative, the prop and mainstay is knocked out from under effective accident prevention work.

Legal Issues Involved in Buying and Selling under Statutory Commodity Standards[1]

by

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While the following article is written from the legal point of view and is addressed to the legal profession, it contains much of interest to the industrialist and the engineer. The footnotes contain the first comprehensive listing of legislative enactments dealing with technical standards. Written from the lawyer's point of view, it provides an interesting background for a study of relations between standards and the mutual obligations of buyer and seller.

Increasingly with the growth of modern commerce, contracts for the sale of goods antedate production, or at least, delivery.[2] As often as not, the parties are separated by long distances. Transactions entered on the basis of description only, and providing for payment against documents of title, flourish.[3] Obviously some assurance is required, on the one hand, that the goods will conform; on the other, that if they do they will be accepted.[4] The growth of the law of sales has not been entirely adequate to cope with the new problems.[5] Chiefly to meet them, cooperative associations, exchanges, and individual trades have framed rules for the grading of commodities within the spheres of their interests and have provided for inspection by impartial agencies to determine the often difficult question of conformity.[6] But they have not been entirely successful. Grading and inspection provisions must be widely accepted to be of value. Restriction to a small area, and to voluntary cooperation, greatly lessens their efficacy in a state-wide or nation-wide market.[7]

It is not surprising, then, that to an increasing extent relief has been sought in legislation. Whether because of the dominant role of the farmer in American government, or the comparative simplicity of standardization in the field of basic raw materials, or the need for a definite basis for large-scale trading, statutory regulation has thus far largely been confined to grain, cotton, fruits, and vegetables. Eggs, dairy products, hay, coal, and petroleum products have also received some attention.[8] The statutes generally either adopt the grades established by the United States Department of Agriculture pursuant to federal statutes,[9] or

[1] Reprinted from the May, 1931, issue of the *Columbia Law Review*.

[2] See Llewellyn, *Cases and Materials on Sales* (1930), 204, 269.

[3] See Kennedy, *Contracts of Sale C.I.F.* (2d ed. 1928); Goitein, *The Law As to C.I.F. Contracts* (2d ed. 1926); Williston, *Sales* (2d ed. 1924) § 280 c; Note (1922), 32 *Yale L. J.* 711, for the complications injected by the development of the C.I.F. contract.

[4] The documentary contract presents one situation in which this question is peculiarly pressing. *Cf.* Lawder v. Mackie, 97 Md. 1, 54 Atl. 634 (1903). Contract for the sale of canned tomatoes f.o.b. seller's city (Baltimore) to the buyer (of New Orleans), terms net cash. In an action by the buyer for non-delivery, it was held that the buyer lost his right to performance by refusing to pay before he had an opportunity to inspect (at New Orleans). The case is undoubtedly sound, under the rule that the f.o.b. term sets the place of delivery so that any inspection before tentative payment must be made at that point (*cf.* Struthers-Zeigler Cooperage Co. v. Farmers Mfg. Co., 233 Mich. 298, 206 N.W. 331 [1926]) and is an ordinary instance of modern "blindfold" payment. But there is no reason why the buyer in this situation should not be given a certificate showing that the goods conformed when put on the cars at Baltimore. He cannot have an agent in every seller's city. See *infra* note 12. And there are further problems. "Unjustifiable rejection of shipments on account of a declining market is the shipper's nightmare, just as enforced acceptance of poorly graded products is the bugbear of the receiver. The answer to the whole problem is definite, practical grades. When shippers furnish products of standard quality and receivers are willing to enter contracts on that basis, the business of marketing farm products will have reached the goal toward which it is marching." Samson, "The March of Standardization," *U. S. Dept. of Agriculture Yearbook* (1920) 353, 362. For further discussion of this problem, see *Report of the Federal Trade Commission on the Wholesale Marketing of Foods* (1919) 82, 172.

[5] Llewellyn, introduction to Finkelstein, *Legal Aspects of Commercial Letters of Credit* (1930).

[6] Holden, "Agricultural Standardization on the Pacific Coast" (1928), 137 *Ann. Amer. Acad. Pol. and Soc. Sci.* 107; *U. S. Dept. of Agriculture, Yearbook* (1928), 217; *ibid.* (1925), 660 *et seq.*

[7] Price, "Grain Standardization" (1921), 11 *Amer. Econ. Rev.* 227; *U. S. Dept. of Agriculture, Yearbook* (1921), 379; *ibid.* (1925), 662.

[8] A highly centralized national industry, such as lumber, has been able to maintain with private sanctions (boycott, etc.) rules as to standards (as well as prices) which might otherwise fall within the realm of public legislation. See *Report, 22d Ann. Meeting Nat. Lumber Manufacturers Assn.* (1924), 16–18; and compare *Report, 8th Ann. Convention* (1910), 120 *et seq.* A few statutes provide for grades for shingles and staves. See *e.g.*, *N. H. Pub. Laws* (1926), c. 167, § 7.

[9] William Beard has commented on this interesting phenomenon in a recent article, "Government by Special Consent" (1930) 25 *Amer. Pol. Sci. Rev.* 61. For the constitutional questions involved, see Atlantic Refining Co. v.

themselves fix the grades[10] or delegate that power to an appropriate state agency.[11] Provision is made in most statutes for the issuance of official labels, for use only on graded goods. The size of containers is often set out in great detail. Inspection service, either under the auspices of the state alone, or in cooperation with the federal authorities, is generally provided. The inspectors are usually required to issue certificates setting forth the grade and condition of the commodity inspected, as well as other information. *Prima facie* validity in all actions is assigned to these certificates in most jurisdictions.[12] In a few statutes they have been made "presumptive" or "conclusive" evidence of the facts to which they testify.[13]

In some instances the use of government grades and inspection is compulsory; more often it is merely permissive. However, the authority of a government stamp and the possibility of attaining wide uniformity by legislation endow

Trumbull, 43 F. (2d) 154 (D. Conn. 1930), commented on in (1930) 40 *Yale L. J.* 116. See also Note (1923) 23 *Columbia Law Rev.* 674.

For the federal grades, see the check list for farm products, formulated by the Bureau of Agricultural Economics, of the Department of Agriculture, March, 1930, and the various regulatory bulletins issued by the Bureau. Also *National Standards for Farm Products*, U. S. Dept. of Agric. Circular No. 8 (1930).

Statutes adopting federal grades: *Ala. Code* (1928) § 169 (cotton); *ibid.*, § 1158 (1) (milk); *Ariz. Rev. Code* (1928) § 3630 (oil); *Ark. Dig. Stat.* (Supp. 1927) § 4834c (vinegar); *Cal. Gen. Laws* (Deering, 1923) § 3095 (grain); Colo. Laws 1921, c. 173 (farm products); *Colo. Comp. Laws* (1921) § 3075, 3077 (butter and condensed milk); *ibid.*, § 3683 (grain); *Conn. Gen. Stat.* (1930) § 1668 (gasoline); Del. Laws 1925, c. 204 § 2 (ice cream); *Fla. Gen. Laws* (Skillman, 1927) § 2006 (fruits and vegetables); *Ga. Ann. Code* (Park, Supp. 1922) § 1885 (a) (cotton); *ibid.*, 2119 (1) (flax seed and linseed oil); *Idaho Comp. Stat.* (1919) § 2032 (farm products); *ibid.*, § 1788 (oils); *Ind. Ann. Stat.* (Burns, 1926) § 3656 (condensed and evaporated milk); *ibid.*, § 8836 (flaxseed oil); *Iowa Code Ann.* (1927) § 9737 (fungible agriculture products); Kan. Laws 1927, c. 13 § 1 (potatoes); *ibid.*, c. 242 § 8c (butter); *Kan. Rev. Stat. Ann.* (1923) 34-306 (hay and straw); La. Acts 1930, No. 80 (fruits and vegetables); *Md. Ann. Code* (Bagby, 1924) Art., 43 § 194 (foods); *ibid.*, art. 97 § 46 (apples); Mich. Pub. Acts 1929, No. 17 (fruits); *ibid.*, No. 220 (potatoes); *Mich. Comp. Laws* (Cahill, 1929) § 5626 (naval stores); *Miss. Ann. Code* (1930) § 3608 (farm products); *ibid.*, § 4770 (gasoline); Mont. Laws 1929, c. 154 § 5b (grain); Laws 1927, c. 109 § 6 (gasoline); Neb. Laws (Spec. Sess. 1930) c. 2 § 5 (grain); *N. C. Code* (1927) § 4784 (containers); N. D. Laws 1929, c. 186 § 2 (potatoes); Laws 1927, c. 155 (grain); *Okla. Comp. Stat. Ann.* (Supp. 1926) § 3718-2 (cotton); *ibid.*, § 11105-1 (grain); *Ore. Laws* (Supp. 1927) § 6123 (grain); *Pa. Stat. Ann.* (Purdon, 1930) 3 § 21 (farm products and containers); *ibid.*, 3 § 164 (naval stores); *ibid.*, 3 § 372 (grapes); S. C. Laws 1922, No. 496 (cotton); *S. D. Comp. Laws* (1929) § 7992 (farm products); *Tex. Ann. Stat.* (Vernon, 1925) § 5602 (farm products); *Va. Code Ann.* (1930) § 1227a (20) (vinegar); Vt. Pub. Acts 1925, No. 102 (maple syrup); *Wash. Comp. Stat.* (Supp. 1927) § 6989 (grain and hay); *Wis. Stat.* (1929) c. 98, 31 (linseed oil); Wyoming Laws 1925, c. 95 (farm products).

[10] Constitutional obstacles, for example, the commerce clause, must always be avoided. Lemke v. Farmers Grain Co., 258 U. S. 50, 42 Sup. Ct. 244 (1921); Shafer v. Farmers Grain Co., 268 U. S. 189, 45 Sup. Ct. 481 (1924) (in both of which standardization was present as an essential element in price fixing schemes).

There is a danger inherent in these statutes that the standards or grades provided will become crystallized, so that revision will become a difficult process. See Harriman, *Standards and Standardization* (1928) 18 (speaking of industrial standards, but the same considerations are as pertinent in the case of agricultural products, where the vicissitudes of nature may necessitate yearly changes). See Clark, *Principles of Marketing* (1922) 401; Jones, *Trade Association Activities and the Law* (1922) 100.

Statutes fixing grades. Fruits and vegetables, *Cal. Codes and Gen. Laws* (Consol. Supp. 1927) § 2805b, 2809; *Fla. Gen. Laws* (Skillman, 1927) (Supp. 1930) § 3254 (3); Idaho Laws, 1929, c. 115 (potatoes); *Ind. Ann. Stat.* (Burns, 1926) § 14611 (sweet potatoes); *Mich. Comp. Laws* (Cahill, 1929) § 5578 (grapes); *N. Y. Consol. Laws* (Cahill, 1930) c. 1 § 160-h (grapes); *Tex. Ann. Stat.* (Vernon, 1925) § 110.

Apples: 37 Stat. 250 (1912), 21 U.S.C.A. § 21 (1927); *Conn. Gen. Stat.* (1930) § 2070; *Del. Laws* 1929, c. 96; *Ky. Stat. Ann.* (Carroll, 1930) § 1905a-20; *Me. Rev. Stat.* (1930) c. 41 § 42; *Md. Ann. Code* (Bagby, 1924) art. 97 § 32; *Mass. Cum. Stat.* (Supp. 1928) c. 94 § 101; *Mich. Comp. Laws* (Cahill, 1929) § 5593; *Mont. Rev. Codes* (Supp. 1927) § 4270; N. H. Laws, 1927, c. 19 § 3; Vt. Pub. Acts 1921, No. 173.

Hay: *N. H. Pub. Laws* (1926) c. 162 § 7.

Eggs: *Fla. Gen. Laws* (Skillman, 1927) § 4125; Iowa Laws 1927, c. 64; *Ore. Gen. Laws* (1929) c. 222 § 3; *Wash. Comp. Laws* (Remington 1922) § 6155.

Oils: *Ark. Dig. Stat.* (Supp. 1927) § 5903; *Neb. Comp. Stat.* (1922) § 7459; *N.D. Comp. Laws Ann.* (Supp. 1925); § 3080a-5; *Tex. Ann. Stat.* (Vernon, 1925) § 1106.

[11] The constitutionality of this form of statute is now settled. See Note (1923) 23 *Columbia Law Rev.* 674, 677; Marshall v. Dept. of Agriculture of Idaho, 44 Idaho 440, 258 Pac. 171 (1927); Detweiler v. Welch, 46 F. (2d) 71 (D. Idaho, 1931). *Cf.* the earlier attitude, in *Ex parte* Peppers, 189 Cal. 682, 209 Pac. 896 (1922). Administrative action in this field, especially with the hearings required by most statutes before the grades are established, is probably more efficacious than unwieldy legislative action. In many states where the statutes are in this form the adoption of the grades promulgated by the United States Department of Agriculture is recommended. In all, it is left open, thus enabling that uniformity which is so requisite in this field to be secured.

Every state except Nevada has enacted at least one statute of this kind. Typical statutes are: 42 *Stat.* 1284 (1923), 7 U.S.C.A. § 257 (1927) (fruits and vegetables); 42 *Stat.* 1517 (1923), 7 U.S.C.A. § 52 (1927) (cotton); 39 *Stat.* 482 (1916), 7 U.S.C.A. § 74 (1927) (grain); *N. Y. Consol. Laws* (Cahill, 1930) c. 1 § 158 (apples).

[12] See *e.g.*, 42 *Stat.* 1517 (1923), 7 U.S.C.A. § 54 (1927); Colo. Laws 1929, c. 99 § 2 c.

[13] "Conclusive:" Minn. Laws 1929, c. 425; N. D. Laws 1929, c. 186. "Presumptive:" *Me. Rev. Stat.* (1930) c. 41 § 36; *N. M. Ann. Stat.* (1929) § 3-108; *N. D. Comp. Laws Ann.* (Supp. 1925) § 2889a 12; *cf.* "Warsaw Rules," 1928, relating to C.I.F. contracts, Note (1929) 29 *Columbia Law Rev.*, 652, 662: Whether these statutes employ "presumptive," "conclusive," and "*prima facie*" in their technical meaning is an open question.

Several of the state statutes expressly give the same validity to federal certificates that they do to their own. *Ark. Dig. Stat.* (Supp. 1927) § 8028 h; *Cal. Codes and Gen. Laws* (Consol. Supp. 1927) § 2810; *Fla. Gen. Laws* (Supp. 1930) § 4400 (1); *Ill. Stat. Ann.* (Callaghan, 1924) c. 5, ¶99; Kans. Laws 1927, c. 13 § 4; *Mass. Cum. Stat.* (Supp. 1928) c. 94 § 1171; *Mo. Rev. Stat.* (1929) § 12442; N. H. Laws 1929, c. 27; *Ore. Laws* (Supp. 1927) § 6127; Vt. Pub. Acts 1929, No. 111; *W. Va. Code Ann.* (1931) c. 19 art. 5 § 7. No statute expressly mentions certificates issued under the auspices of another state. *Cf. infra* note 30. For a collection of cases upholding the constitutionality

these permissive statutes with considerable importance.[14] The general consensus of opinion is that these grading statutes are establishing a broad basis for intelligent dealing, with misunderstandings about grades,[15] unjustifiable rejection in a declining market, and the shipment of non-conforming goods when the market is climbing, all reduced to a minimum.[16] While purchase by grade or specification, with competent inspection to determine the question of performance by the seller, is primarily of value to the large-scale purchaser,[17] it may well simplify the buying problems of the ultimate consumer.[18]

Compulsory inspection, label, and registration provisions are the prominent features of many statutes designed to protect the purchasers of fertilizers, stock feed, and seeds, the quality of which it is peculiarly difficult for the buyer to discover by his own examination.[19] Submission of samples for chemical analysis by the state is mandatory, with stringent provisions as to the information to be divulged by the label.[20] Some statutes provide, in addition, for the grading of fertilizer and feed.[21] Further sanctions are contained in the power often given to the administrative officer to prevent a lowering in quality or change of ingredients in the brands registered without special circumstances being shown, and to publish the results of his analyses.[22]

The grading and labeling provisions are motivated by different needs—the one is aimed primarily at relieving mercantile hazards, the other at alleviating risks of loss more serious than "loss of bargain"[23]—but the legal issues presented by both are similar. How is the seller's obligation affected by these legislative pronouncements? When does the buyer come under a duty to accept the goods and pay the price? What new remedies, if any, are provided for breach of obligation?

Where an act is made a penal offense, a contract calling for its performance is void, under ordinary principles of contract law, even though the statute does not specifically so provide. Consequently, neither party can sue upon an agreement containing a clause which precludes conformity to a mandatory grading, inspection, or labeling statute, and a waiver of such conformity is nugatory.[24] And it is settled that a

of statutes making a chemical analysis *prima facie* evidence, see (1923) 29 A.L.R. 289.

[14] See Price, *supra* note 7. For figures showing the uniformity of federal inspection, see *U. S. Dept. of Agriculture, Yearbook* (1928) 53–54. For the figures on the increase in the use of federal inspection facilities, see *U. S. Dept. of Agriculture, Yearbook* (1921) 195; *ibid.* (1923) 30; *ibid.* (1925) 942; *ibid.* (1926) 61; *ibid.* (1927) 42; *ibid.* (1928) 337, 354; *ibid.* (1930) 33. Mr. F. W. Read, manager of the Standardization Department of the California Fruit Exchange, has informed the writer that the tendency is to include government inspection in form contracts.

[15] *Cf.* Gandy v. Seymour Slack Stave Co., 50 Ind. App. 72, 90 N.E. 915 (1910); Hettler Lumber Co. v. Olds, 221 Fed. 612 (C.C.A. 6th, 1915) for striking examples of the difficulties involved in sales by grade when there is more than one classification.

As for sales by description—"Heretofore contracts have almost invariably called for 'sound red ripe tomatoes.' On first consideration this specification would seem anything but vague, but as a matter of fact, neither grower nor canner expects strict conformity to the requirement. As a practical matter, the contract terms mean one thing when prices are high, and something very different when prices are low." *U. S. Dept. of Agriculture, Yearbook* (1920) 725. For an illustration in the engineering field see Harriman, *supra* note 10, at 102.

[16] See the interesting discussion in the *U. S. Dept. of Agriculture, Yearbook* (1925) 660 *et seq.*

The recent growth of telegraphic market news services, and of the fruit auctions, conducted entirely on the basis of inspection certificates issued for fruit often thousands of miles away, are striking illustrations of the utility of uniform grades and inspection methods. For an account of the working of the auctions, see *U. S. Dept. of Agriculture, Yearbook* (1924) 35; *ibid.* (1925) 658.

For the advantages of standardization and grading in general, see Clark, *op. cit. supra* note 9, 26, 397 *et seq.*, 527; Harriman, *op. cit. supra* note 9, 100; Weld, *Marketing of Farm Products* (1920) 362; Note (1917) 31 *Quart. Journ. of Econ.* 341; Tenny, "Standardization of Farm Products" (1928) 137 *Ann. Amer. Acad. Pol. and Soc. Sci.* 205, 206; Chase and Schlink, *Your Money's Worth* (1927) 195; *U. S. Dept. of Agriculture, Yearbook* (1923) 30; *ibid.* (1924) 34 *et seq.*; *ibid.* (1925) 642; *ibid.* (1926) 412, 725; *ibid.* (1927) 627, 681; *ibid.* (1930) 35. *National Standards for Farm Products, supra* note 9, at 5. These writers all argue vigorously in behalf of standardization as one of the most promising solutions to the complexities of modern economic life. But Carpenter, *Dollars and Sense* (1928) Intro. xiii, and 48 *et seq.* views with alarm. He regards standardization as but a tentacle put forth by the octopus of communism to gather us into its midst.

[17] Most of the grading statutes are confined to sales in large quantities. See *e.g.*, Kan. Laws 1927, c. 13 § 1; N. D. Laws 1929, c. 186 § 2 (carload lots); *Md. Ann. Code* (Bagby, 1924) art. 97 § 46; *N. Y. Consol. Laws* (Cahill, 1930) c. 1 § 158 (closed packages).

[18] For the extent to which modern advertising and salesmanship have rendered intelligent buying difficult, see Handler, "False and Misleading Advertising" (1929) 39 *Yale L. J.* 22; Handler, "Jurisdiction of the Federal Trade Commission over False Advertising" (1931) 31 *Columbia Law Rev.* 527; Chase and Schlink, *op. cit. supra* note 16, *passim*; Edwards, "Standardization in the Household" (1928) 137 *Ann. Amer. Acad. Pol. and Soc. Sci.* 213, 217.

[19] The Pure Food Laws of the United States and the various states contain similar provisions. The constitutionality of these statutes is settled. Savage v. Jones, 225 U. S. 501, 32 Sup. Ct. 715 (1912); Standard Stock Food Co. v. Wright, 225 U. S. 540, 32 Sup. Ct. 784 (1912); Patapsco Guano Co. v. North Carolina Board of Agriculture, 171 U. S. 345, 18 Sup. Ct. 862 (1898); Southern Cotton Oil Co. v. Raines, 167 Ga. 880, 147 S.E. 77 (1929).

[20] All but seven states regulate the sale of fertilizer. Typical statutes are *Del. Laws* (1927) c. 49; *Fla. Gen. Laws* (Supp. 1930) § 3807; Kan. Laws 1927, c. 14; Typical seed statutes are *Mo. Rev. Stat.* (1929) § 12603; *N. C. Pub. Laws* (1929) c. 194; *Tex. Ann. Stat.* (Vernon, 1925) § 84. The commercial feeding stuffs statutes are exemplified by Colo. Laws 1929, c. 71; *Md. Ann. Code* (Bagby, 1924) art. 48 § 95; *Wyo. Comp. Stat. Ann.* (1920) § 3759.

[21] See *e.g.*, *Ark. Dig. Stat.* (Supp. 1927) § 4725; *Ga. Ann. Code* (Park, 1914) § 1779 (b); *Minn. Stat.* (Mason, 1927) § 3881; *Tex. Ann. Stat.* (Vernon, 1925) § 96.

[22] See statutes cited, *supra* note 20.

[23] *Cf.* Llewellyn, *Cases and Materials on Sales* (1930) 340.

[24] Burdette v. Blackshear Mfg. Co., 41 Ga. App. 391, 153 S.E. 104 (1930); Faircloth v. DeLeon, 81 Ga. 158,

seller who has not complied with these statutory requirements cannot sue on the contract.[25] Where the contract is still executory, the buyer is entitled to rescind[26] or to reject performance.[27] Contracts not made in accordance with the grading statues are, of course, not void where compliance with the statute is not mandatory.[28]

Where the parties, availing themselves of the facilities provided by a merely permissive statute, have specifically agreed upon government inspection (just as where a provision is made for inspection by a private party) the certificate issued by the chosen inspector must show that the goods conformed to the contract.[29] When this appears, the seller can sue for the price (the other requirements of the price action being satisfied) or for non-acceptance.[30] Evidence to rebut the certificate is said to be inadmissible, except to show "fraud" in which the seller participated.[31] If the certificate shows on its face a non-compliance with the contract, the buyer is entitled to reject it. That the goods do in fact conform and that the certificate is a mistake is no answer.[32]

These cases afford an interesting comparison to the cases in which no specific provision is included in the contract,[33] but in which the seller tenders the buyer a certificate showing that the goods conform. The statutes generally provide that the certificate shall be *prima facie* evidence of grade and condition.[34] Thus, here, evidence in rebuttal is admissible. It is questionable whether such evidence would be admissible where through long course of dealing a custom develops of tendering the inspection certificate, as seems to be happening in certain lines.[35]

It is obvious that the seller's obligation as to the goods and the buyer's remedies for breach thereof are materially affected by the labeling and analysis statutes. Under the Uniform Sales Act, there is an implied warranty that the goods are fit for the particular purpose for which they are bought, where (1) that purpose is disclosed to the seller and (2) his skill is relied on by the buyer in making the purchase.[36] There is a conflict as to whether the statutory requirement that the ingredients be set forth on the label imposes an additional warranty on the seller, or whether that provision supplants the warranty of fitness for a particular purpose.[37]

7 S. E. 640 (1888); Fleckley v. Leyden, 63 Ga. 215 (1879); Southern States Phosphate Co. v. Arthurs, 97 S.C. 358, 81 S.E. 663 (1914).

[25] Williston, *Sales* (1924) § 668 *et seq.*, espec. 669 n. 94; Vanmeter v. Spurrier, 94 Ky. 22, 21 S.W. 337 (1893); Hodges v. Montezuma Fertilizer Co., 150 Ga. 248, 103 S.E. 231 (1920); *cf.* McRae v. Heath, 60 Cal. App. 64, 212 Pac. 228 (1923); and see collections of cases in Note, 12 L.R.A. (N.S.) 575, 596 (1907); Note 43 L.R.A. (N.S.) 1109 (1912). But *cf.* Niemeyer v. Wright, 79 Va. 239 (1881); Arlington Oil and Guano Co. v. Swann. 13 Ga. App. 62, 79 S.E. 476 (1913); Makris v. Moore, 280 Pac. 721 (Utah 1929).

[26] New Century Mfg. Co. v. Scheurer, 30 S.W. (2d) 388 (Tex. Civ. App. 1930) (violation of anti-trust laws).

[27] See Lloyd-Garretson Co. v. Marvin, 128 Ore. 191, 201, 274 Pac. 128, 131 (1929).

[28] Where the grades fixed are compulsory, sales not made in accordance therewith are, of course, unlawful (unless coming within the exceptions usually provided). See *e.g.*, 42 *Stat.* 1517 (1923), 7 U.S.C.A. § 52 (1927); 39 *Stat.* 483 (1916), 7 U.S.C.A. § 76 (1927); *Ala. Code* (1928) § 169; Idaho Laws 1929, c. 115. But *cf.* Hohenberg & Co. v. Hendrix, 213 Ala. 406, 105 So. 195 (1924).

[29] A failure to provide the inspection required by the contract is a material breach by the defaulting party. *Cf.* Estes v. Curtiss Aeroplane and Motor Corp., 232 N.Y. 572, 134 N.E. 576 (1922).

[30] Field v. Descalzi, 276 Pa. 230, 120 Atl. 113 (1923). Consent to a reinspection, which shows different results, may bar the seller's action, even though no consideration is shown for the consent. Eastern Lumber Co. v. Field, 100 Wash. 79, 170 Pac. 360 (1918). The fact that the certificate has been issued under the auspices of another state makes no difference. Field v. Descalzi, *supra;* Citizen's Independent Mill & Elevator Co. v. Perkins, 52 Okla. 242, 152 Pac. 443 (1915). But *cf.* Int. & G.N.R. Co. v. Diamond Roller Mills, 36 Tex. Civ. App. 590, 82 S.W. 660 (1904).

[31] A charge that if the grade shown in the certificate was a gross mistake the buyer could recover damages for breach of contract has been held to constitute reversible error. Fed. Grain Co. v. Hayes Grain and Commission Co., 161 Ark. 51, 255 S.W. 307 (1923); *cf.* Moore-Seaver Grain Co. v. Blum Milling Co., 277 S.W. 78 (Tex. Comm. App. 1925); Brooke v. Laurens Milling Co., 78 S.C. 200, 58 S.E. 806 (1907). But "fraud" may be presumed from a great disparity in result disclosed by a second inspection. See Hettler Lumber Co. v. Olds, *supra* note 15, at 616. But *cf.* American Fertilizing Co. v. Thomas, 181 N.C. 274, 106 S.E. 835 (1921); Citizen's Independent Mill and Elevator Co. v. Perkins, *supra* note 30.

[32] Van Dusen Harrington Co. v. Jahn & Co., 127 Wash. 426, 221 Pac. 301 (1923); Hind v. Willich, 127 Misc. 355, 216 N. Y. Supp. 155 (Sup. Ct. 1926). But *cf.* Gillespie Bros. & Co. v. Thompson Bros. & Co., 13 LI.L. Rep. 519 (C.A. 1922). In view of the fact that the documents usually arrive long before the goods, and that the buyer may want to resell immediately, this result seems sound. Whether it should be extended to the case where the goods have already arrived and the buyer refuses to inspect and see if they conform to the contract is another question.

[33] The further question is here raised of what grading system is to be employed where the contract provides for a sale by grade without specifying any system. *Cf.* Braufman v. Bender, 58 N.D. 165, 225 N.W. 69 (1929) (grades of U. S. Dept. of Agric. admitted in evidence); Gandy v. Seymour Slack Stave Co., *supra* note 15 (trade association grades).

[34] See *supra* note 12.

[35] See *supra* note 14.

[36] § 15 (1).

[37] *Cf.* Poovey v. Int. Sugar Feed. No. 2 Co., 191 N.C. 722, 133 S.E. 12 (1926); Tomlinson v. Morgan, 166 N.C. 557, 82 S.E. 953 (1914); Swift v. Aydlett, 192 N.C. 330, 135 S.E. 141 (1926). In the latter case plaintiff sued on a note given for the price of fertilizer. The defense was failure of consideration. The court said: "A seller of commercial fertilizer to a farmer for use on crops... must deliver to his vendee a commodity which fulfills the warranty implied by law, that it is reasonably fit for the use contemplated by the parties to the sale, and also fulfills the warranty, required by the statute, that it contains chemical ingredients of the guaranteed analysis." 192 N.C. at 337, 135 S.E. at 144. But *cf.* American Agricultural Chemical Co. v. McKinney, 173 Ky. 820, 191 S.W. 647 (1917). Evidence of farmers, *B*'s vendees, that the fertilizer sold to them

Another view which has received some support is that the buyer's remedy where the seller has not complied with the statute is different and apart from that ordinarily given for a breach of warranty.[38]

In connection with the right of action specifically provided in several of the fertilizer, seed, and stock food statutes it should be noted that most of them limit the remedy to an action against the seller by the purchaser, thereby introducing the common law concept of privity.[39] But several are susceptible of the interpretation that privity is no longer requisite.[40]

In view of the extension of the seller's liability involved in the labeling statutes it is but natural that attempts should be made to contract out of the possibility of heavy damages.[41] These stipulations have been enforced as reasonable liquidations of damages, but they are generally given a restrictive construction.[42]

was worthless, is inadmissible when *S* pleads compliance with statutory requirements. "The fertilizer company is only required to furnish that character and quality of fertilizer described in the analysis made by the experiment station and set out in the labels attached to the package it offers for sale. When it has done this, it has complied with every obligation imposed upon it in regard to the character or quality of the fertilizer. The observance of these statutory requirements takes the place of the ordinary express or implied guaranty [warranty?]. There is no implied guarantee on its part that the fertilizer will be beneficial in the cultivation of any crop in connection with which it may be used. In other words, its whole guarantee is contained in the label." 173 Ky. at 829, 191 S.W. at 651; *cf.* Duncan v. Dean, 205 Ky. 470, 266 S.W. 20 (1924); Warner Cotton Oil Mfg. Co. v. Gorman, 123 Ark. 279, 185 S.W. 433 (1916).

There are several cases, decided on the basis of peculiar facts to the effect that where the statute provides a measure of damages for a deficiency in quality of fertilizers, consequential damages resulting from a crop shortage cannot generally be recovered. Armour Fertilizer Works v. McLawhorn, 158 N.C. 274, 73 S.E. 883 (1912); Carson v. Bunting, 154 N.C. 530, 95 S.E. 171 (1911); Richmond Guano Co. v. Kirkpatrick, 111 S.C. 469, 98 S.E. 327 (1919); but evidence of crop shortage is generally admissible to show non-compliance with the statute. Carter v. McGill, 168 N.C. 507, 84 S.E. 802 (1915); Hardy Packing Co. v. Sprigg, 84 S.W. 532 (Ky. 1905); see Note L.R.A. 1915 D 875. But *cf.* Jones v. Cordele Guano Co., 94 Ga. 14, 20 S.E. 265 (1894). This statutory liquidation of damages has been held constitutional. Adams v. American Agricultural Chemical Co., 78 Fla. 362, 82 So. 850 (1919).

[38] Simpkins v. Moorehead & McGee, 7 Tenn. Civ. App. 559 (1918); and Geren v. Courts Trading Co., 99 Okla. 170, 226 Pac. 369 (1924) in which defective seeds were sent to the plaintiff, a dealer, which his customers returned to him. He was allowed to recover the price he paid, freight, and loss of profits. The court charged it was not necessary to find a warranty from the evidence—if the seeds were defective, the facts were covered by statute. In the Simpkins case, the statute provided that seeds below a certain standard were unsound, and should not be sold without a communication to the buyer of the lack of germinating quality. The court found no such information had been conveyed. The seller relied on a stipulation in the contract negativing all warranty of soundness. The court said, in holding for the buyer: "Nor can any negligence of Simpkins or his purchase of the seeds upon his own judgment or that of his friends have the effect of waiving the statute or of taking away his right to complain of the dealer for not observing its provisions." 7 Tenn. Civ. App. at 562.

"It is probably true there was no express warranty of germinability, and it may also be true that the circumstances excluded any implied warranty as interpreted by the greater number of authorities treating of the common law measure of liability. But we apprehend and so hold that the rule is changed, and that there must be in Tennessee an implied warranty on the part of the dealer that his seeds are up to the standard prescribed by law in the absence of positive and lawfully authorized communication at the time of the fact that the seeds are below the standard of germinating power prescribed by statute." 7 Tenn. Civ. App. at 563. In this case the buyer would be without remedy under the Sales Act.

It has even been held that the liquidated damages recoverable under the statute for breach of its terms can be recovered even though the article (fertilizer) was of greater value than if it had contained the ingredients set forth on the label. Atlantic Gulf Fertilizer Co. v. Mayo, 97 Fla. 848, 119 So. 513 (1929); *cf.* Southern Cotton Oil Co. v. Raines, 167 Ga. 880, 147 S.E. 77 (1929).

[39] *Ark. Dig. Stat.* (Supp. 1927) § 4724; *Fla. Gen. Laws* (Skillman, 1927) § 3815; *Ga. Ann. Code* (Park, 1914) § 1774; *Md. Ann. Code* (Bagby, 1924) art. 61 § 11; *Mich. Comp. Laws* (Cahill, 1929) § 5066; *N. C. Code* (1927) §4695; Okla. Laws 1929, c. 230 § 11; *S. C. Code of Laws* (1912) § 2329; *S. D. Comp. Laws* (1929) § 7926-m; *Tenn. Ann. Code* (Supp. 1926) § 325a 62.

[40] *Ill. Stat. Ann.* (Callaghan, 1924) c. 38 § 243; *La. Rev. Stat. Ann.* (Marr, Supp. 1926) 44; *Pa. Stat. Ann.* (Purdon, 1930) 3 § 55; *Tex. Ann. Stat.* (Vernon, 1925) art. 99; *Va. Code Ann.* (1930) § 1110; *W. Va. Code Ann.* (1931) c. 19, art. 16 § 16.

[41] *Cf.* cases cited, *supra* note 24.

[42] In Patterson v. Orangeburg Fertilizer Co., 117 S.C. 140, 108 S.E. 401 (1921), a stipulation that there was no guarantee of results was held ineffective to bar an action by the buyer for damages. (But note that in that case there was an affirmatively harmful substance present.) In Jones v. Cordele Guano Co., *supra* note 37, an express disclaimer of warranty as to results on the crops was held not to render inadmissible evidence showing results offered for the purpose of showing noncompliance with the statute. But ordinary warranties are commonly excluded by an express contract provision to that effect. Arlington Oil and Guano Co. v. Swann, 13 Ga. App. 562, 79 S.E. 476 (1913); Hampton Guano Co. v. Hill Livestock Co., 168 N.C. 442, 84 S.E. 774 (1915). And compare the following series of North Carolina cases. In Armour Fertilizer Works v. Aiken, 175 N.C. 98, 95 S.E. 657 (1918), the note sued on stipulated: "I hereby acknowledge I have received and used the above fertilizer, without any guarantee on the part of Armour Fertilizer Works or its agents as to results from its use, and which have been inspected, tagged, and branded under and in accordance with the laws of this state; and I hereby waive all claims, damages, and penalties in case of deficiency, except claims for the actual commercial value of deficiency when, and only when, ascertained and determined by the state chemist, from samples taken in the presence of the seller or the seller's authorized representative, from fertilizers for which this note was given." A demurrer to a defense that the fertilizer was worthless was sustained. All evidence of the effect of the fertilizer on the crops was held excluded by this stipulation. In Swift & Co. v. Etheridge, 190 N.C. 162, 129 S.E. 453 (1925), the stipulation was to the same effect, "without any warranty as to results from its use or otherwise." Here the buyer pleaded failure of consideration, and although a new trial was granted the seller, evidence of the worthlessness of the fertilizer was specifically said to be admissible. 190 N.C. at 168, 129 S.E. at 457. This view was sustained in the later case of Swift & Co. v. Aydlett, *supra* note 37. Compare the farm machinery cases, collected in Note (1928) 28 *Columbia Law Rev.* 466.

ASA PROJECTS

The Work of the ASA Sectional Committee on the Rating of Rivers

by

N. C. Grover *and* W. G. Hoyt[1]

The advisability of standardizing the bases for computing water-power resources and the units for expressing them for statistical use was brought forcefully to the attention of engineers at the World Power Conference at London, in July, 1924. At that conference statistics were given on the developed and undeveloped water-power resources of the countries represented. These statistics were not comparable as between different countries, however, as there were no accepted standard rules for computing the power resources of a river or for stating the capacity of a water-power plant.

There were differences in the units for expressing power. Some countries used the electrical unit (kilowatt), others the mechanical unit (horsepower). Of those countries that used the horsepower some used the English and American value, others the French and German value, and still others the Austrian value. There were also differences in the bases on which water-power capacity was estimated. Some countries estimated their water-power resources in terms of the energy theoretically possible of attainment; others used reduction factors to allow for losses in head, losses in efficiency of turbines and generators, and losses in transmission; some used the low flow of water, and others the average, and there were nearly as many definitions of rates of flow as there were countries. There was no uniformity in the presentation of the increase in power resulting from the storage of water.

Believing that a common standard for comparison of the statistics of water power was important, the American Standards Association began in October, 1924, consideration of the advisability of formulating standards for the rating of rivers of the United States. The desirability of having such standards was evident, and in November, 1925, a sectional committee was organized for the purpose of attempting their formulation. This sectional committee was organized under the sponsorship of the United States Geological Survey, with N. C. Grover, chief hydraulic engineer, chairman, and W. G. Hoyt, hydraulic engineer, secretary, and was composed of 40 engineers interested in water-power development because of their connection with promoting, financing, constructing, or managing such developments. By 1927 the committee had reached essential agreement.

In the meantime the World Power Conference had requested the International Electrotechnical Commission to submit recommendations for international rules. The work of the sectional committee of the American Standards Association was, therefore, held in abeyance in the hope that international agreement could be obtained, thus putting the world's water-power statistics on a common basis. Early in 1927 the International Electrotechnical Commission appointed the national committees of the following countries as an International Advisory Committee on this project: Austria, Canada, Czechoslovakia, France, Germany, Great Britain, Italy, Norway, Sweden, Switzerland, the United States.

In view of the progress already made in this country, our committee was named as the secretariat of the International Advisory Committee.

At the outset of the work of the sectional committee of the American Standards Association the scope of the project was defined, and essentially the same definition was later adopted by the international committee as follows:

> An agreement as to bases for computing and units for expressing water-power resources for statistical use and for the purpose of making comparisons between different rivers, river basins, regions, and countries, the rules to be short, simple, and applicable to the various conditions throughout the world.

Many of the differences in practice were not easily reconciled because of different methods that had been developed in different countries, and to a lesser degree because of differences in rivers and in the use made of power in different regions or countries. These differences were

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carefully considered, first by engineers in this country and later by those abroad, concessions were made by all in the interest of the common good, and substantial agreements were finally reached.

The tentative agreement reached in 1927 among the members of the sectional committee of the American Standards Association after nearly two years of study was as follows:

Bases

(*a*) The duration curve based upon records of daily discharge of at least five years, and preferably longer periods, should be used in the determination of the rates of flow that are made a part of the rules.

(*b*) One hundred per cent efficiency and gross head of the site should be used, leaving to the judgment of the user of the data the determination of the proper efficiency factor or factors applicable to any situation.

(*c*) Energy should be expressed preferably in kilowatts with the horsepower equivalent in parentheses.

Rules

Undeveloped site or stretch of river—The rating of undeveloped sites will show gross energy based on 100 per cent efficiency and gross head, and will be expressed in kilowatts with the horsepower equivalent in parentheses, except in instances where it is desirable to make comparisons on the horsepower basis when the gross horsepower will be given and the equivalent kilowatts in parentheses. In this rule gross head is the difference in elevation of water at the point of diversion or pool created by the dam and the return of water to the stream; or if a stretch of river be considered on which surveys are not available to determine the probable method of development, the total gross head which it is believed may be developed.

The rating will be shown for the following conditions:

1. Power based on natural flow available 90 per cent of the time. The 90-per-cent-time-flow is the flow occurring at the site 90 per cent of the time as determined in general by a study of the records of mean daily discharge. In instances where the records are fragmentary or of short duration, however, estimate of the 90-per-cent-time-flow will be based on all available data and applied over a sufficient length of time to render improbable that additional records will materially change it. Mean weekly or mean monthly flows may give reasonable accuracy but will in general show exaggerated flow.

Theoretical kilowatt = $H \times Q_{90} \times .08$

Theoretical horsepower = $H \times Q_{90} \times .11$

Where H = gross head in feet corresponding to 90-per-cent-time-flow

Q_{90} = 90-per-cent-time-flow in second-feet. (Cubic feet per second)

.08 and .11 = factors to give approximately 100 per cent efficiency

2. Power based on natural flow available 50 per cent of the time; the 50-per-cent-time-flow being the flow occurring at the site for half the time based upon a study of the record of mean daily discharge or so estimated that it would not be materially changed were a study to be based on long-time records of daily discharge.

Theoretical kilowatts = $H \times Q_{50} \times .08$

Theoretical horsepower = $H \times Q_{50} \times .11$

Where H = gross head in feet corresponding to 50-per-cent-time-flow

Q_{50} = 50-per-cent-time-flow in second-feet. (Cubic feet per second)

.08 and .11 = factors to give approximately 100 per cent efficiency

3. Capacity of reservoir sites, above the lowest level of draw down, expressed either in acre-feet or cubic-feet, that is reasonably probable of utilization, directly or indirectly for increasing the power resources, together with an estimate of the resulting increase in power resources stated in such terms that a comparison may be made with the power resource obtained by rules 1 and 2 of the site or stretches of the river affected by the storage.

Developed sites—The rating of developed sites will show:

4. Power at the site to be determined in a manner similar to that for an undeveloped site.

5. Manufacturers ratings of limiting machine capacities expressed in kilowatts.

In connection with the International project, this tentative American agreement was circulated among the national committees constituting the International Advisory Committee, together with a digest of such other rules and bases as were in use among the different countries. After three years of discussion the international committee, at a meeting held in Stockholm, July 4, 1930, made the following recommendations to the International Electrotechnical Commission:

1. That the kilowatt be adopted as the unit of power;

2. That either the foot or the meter be adopted as the unit of head;

3. That the full power of the water and the gross head be used in the computations, showing in kilowatts the full theoretical power at 100 per cent efficiency;

4. That the ratings be based on three rates of flow—

(*a*) Low rating, based on ordinary minimum flow, defined as the natural or present flow available 95 per cent of the time, or approximate equivalent, with a statement as to the month of occurrence of the low flow;

(*b*) Middle rating, based on median flow, defined as natural or present flow available 50 per cent of the time, or approximate equivalent;

(*c*) Average rating based on arithmetical mean flow; but

(*d*) That it shall further be permissible to any country desiring it to report in addition ratings of Q75 and Q25 on the duration curve;

5. That the rating of storage be based on the water capacity and the gross head and be expressed in terms of theoretical kilowatt-hours of energy in the water stored;

6. That the rating of a developed site state the installed turbine capacity of the power plant expressed in kilowatts, and, in addition, that the rating of the site be made in the same manner as for an undeveloped site.

It is hoped and expected that the rules and bases recommended at Stockholm will soon be adopted by the International Electrotechnical Commission for use in international statistics. Thereafter, the work of the sectional committee of the American Standards Association will be resumed in the hope that standards in harmony with the international standards may be recommended to and adopted by the American Standards Association as standards for the United States. The recommendations of the international committee agree closely with the bases and rules tentatively adopted by the sectional committee in 1926, the greatest departure being the use of a somewhat lower rate of flow for use in estimating the low-power rating.

The adoption of these rules and bases by the American Standards Association for use in this country, by the International Electrotechnical Commission and the World Power Conference for use internationally, and by engineers everywhere will remove the confusion that now arises whenever attempts are made to compare water-power statistics prepared in different countries or by different engineers in the same country.

Draft of Proposed Standards on Radio Published

The Sectional Committee on Radio (C16) sponsored by the American Institute of Electrical Engineers and the Institute of Radio Engineers, which was reorganized in September, 1929, has been actively at work since its reorganization and has issued a 44-page draft booklet containing standard definitions of terms used in radio; standard tests of broadcast radio receivers; standard vacuum tube base and socket dimensions; and manufacturing standards applying to broadcast receivers. The definitions of terms used in radio cover the following nine headings: general; wave propagation; transmission; reception; antennas; direction finding; vacuum tubes; electro-acoustic devices; circuit elements, devices, and instruments.

The purpose of the draft is to place various standards proposed therein before the members of the sectional committee for final letter ballot. After the ballot has been completed, the standards will be submitted to the American Standards Association for approval. Copies of the draft may be secured from the American Standards Association.

Note for Users of Standard on Wrench Head Bolts and Wrench Openings

Attention of all those using the American Tentative Standard on Wrench Head Bolts and Nuts and Wrench Openings (B18b-1927) should be called to a peculiar situation which has arisen with regard to this standard. The standard was developed by a sectional committee sponsored by the American Society of Mechanical Engineers and the Society of Automotive Engineers and formally approved by the American Standards Association in 1927. It appeared, however, that the manufacturers of bolts and nuts after approving the standard found it necessary to request two changes in dimensions of nuts. Accordingly, efforts were made by the manufacturers to have the dimensions in question changed. This matter was taken up by the sectional committee and agreement was reached on the following changes:

1. The width across flats of all $^{5}/_{8}$ in. nuts in Tables 5, 6, 7, and 10 of the standard was to be increased from $^{15}/_{16}$ in. to 1 in.

2. The thickness of the $^{9}/_{16}$ in. nuts in Tables 5 and 6 of the standard was to be increased from $^{31}/_{64}$ in. to $^{1}/_{2}$ in.

A few more changes of minor importance being also contemplated by the sectional committee at that time, it was decided to postpone submission of the above changes to ASA for formal approval until the minor changes should also have been decided upon by the sectional committee. The A.S.M.E. has in the meantime reprinted the standard with the above changes without these revisions having been approved by ASA. Consequently, there are

now discrepancies—in otherwise identical copies—between the original standard as formally approved by ASA, and the revised edition, not yet approved by the American Standards Association.

It should, therefore, be kept in mind by the users of the standard that the latest edition should be considered as giving the dimensions on which agreement actually has been shown to exist in the sectional committee including the representatives of the manufacturers' group. In order to remove the resulting confusion, the American Standards Association has requested the immediate formal submission of the changes in question.

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Publish Requirements for Fire Resistance in Buildings

The Building Code Committee of the United States Department of Commerce has just issued a new bulletin in the Building and Housing series, *Recommended Minimum Requirements for Fire Resistance in Buildings*. This bulletin classifies buildings into the following five groups on the basis of occupancy: public, institutional, residential, business, and garages (including hangars and barns); and into the following six groups on the basis of type of construction: fully protected, protected, heavy timber, masonry wall and joist, wood frame, and unprotected metal. The fire-resistance requirements for all of these classes are discussed in the bulletin.

The bulletin states that the determination of fire resistance of building materials shall be based upon the American Standard Specifications for Fire Tests of Building Construction and Materials which was approved by ASA in 1926.

The work of the Building Code Committee has a bearing on other standards approved by ASA or under development. This is particularly true of the Building Exits Code (A9-1929). As a result of a joint meeting of the Building Code Committee of the United States Department of Commerce and the Building Exits Code sectional committee, a cooperative arrangement has been developed to assure that the work of the two committees will be in complete harmony.

According to Building and Housing Bulletin number eight, *Recommended Practice for Arrangement of Building Codes*, the Building Code Committee has outlined its work to include elevators, light, and ventilation, precautions during erection, plumbing, and electricity, all of which are subjects covered by standards or projects under the procedure of the American Standards Association.

Copies of the Building and Housing Bulletin (number 14) may be obtained from the office of the American Standards Association, or direct from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents per copy.

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Manual of A.R.E.A. Offers Variety of Specifications

The attention of readers of the ASA BULLETIN interested in obtaining carefully drawn specifications covering many widely used products is called to the work of the American Railway Engineering Association in this field. The *A.R.E.A. Manuals* are based upon 30 years of work by the Railway Engineering Association including investigations, studies, reports, recommendations of committees, and practical experience.

These *Manuals* are intended for railway use but the nature of much of the material covered gives them a far wider application. The following list of specifications, tables, and other data in the 1929 edition, for example, of the *A.R.E.A. Manual* indicates the scope of this material: specifications for concrete fence posts; specifications for timber piles; size classification of yard lumber; list of standard lumber abbreviations; grades for red cedar shingles; specifications for structural wood joist, plank, beams, stringers, and posts; tables of working stresses for lumber; instructions for repairing defective or worn surfaces of concrete; instructions covering first aid to the injured, procedure in case of accident, and prevention of accidents; water supply, piping, reservoirs, treatment of water for quality; standard method of water analysis and interpretation of results; water softeners and other treatments of water; specifications for the preservative treatments of wood; and specifications for different kinds of wood preservatives.

The section of the *Manual* on "Buildings" contains recommendations referring to roofing, flooring, plumbing, brickwork, paints and painting, iron and steel work, weights of materials giving live loads and impacts in pounds per square foot, and other valuable data equally applicable to railway buildings and to buildings which are intended to be used for other than railway purposes.

The section on "Masonry" gives information on the design of retaining walls, specifications for culvert pipe, Portland cement, billet-steel, concrete reinforcement bars, and instructions for backfilling.

National Code for Elevators, Escalators, and Dumbwaiters Approved by ASA[1]

A new national safety code for elevators, dumbwaiters, and escalators (A17-1931), developed under the technical direction of the American Society of Mechanical Engineers, the American Institute of Architects, and the U. S. Bureau of Standards, has just been approved by the American Standards Association. Approval of the revised code by the Association followed nearly four years of research on elevator safety devices at the United States Bureau of Standards and extensive investigation by a technical committee composed of 38 representatives of architectural, engineering, governmental, and other organizations. Sullivan W. Jones, former state architect of New York and representative of the American Institute of Architects, is chairman of the committee, and John A. Dickinson, Research Fellow of the Bureau of Standards, who conducted the research work at the Bureau, is secretary.

In the tests conducted during the research work, the suspended elevators were fully loaded and released from their cables, allowing them to fall freely in the shafts. Motion picture apparatus fixed under the elevators and clicking off pictures at the rate of 3600 per minute revealed the precise operation and trustworthiness of the safety devices. Loaded elevators were also dropped onto the buffers at the bottom of the shaft and especially designed apparatus measured the forces involved during the fraction of a second before the plunge was completely stopped. This research led to the re-design of almost all elevator buffers.

For the first time the national elevator code permits the operation of more than one elevator in a single shaft, thus removing one of the obstacles to the erection of skyscrapers—the excessive space required for elevators. The code provides rigid safeguards to eliminate any possibility of collision between two elevators in the same shaft. The code also provides for two-story cars which consist of two separate cages, one above the other to serve two floors simultaneously from the same shaft. These will not be "one man cars," however, an operator for each of the two cages being required by the code. Safety devices will prevent the two-story car from moving until the safety gates of both cages are closed.

Further provision is made for a new type of express-local system in which the master express elevators will stop at only three or four express or plaza floors, ten, fifteen, or even more stops apart, at which points passengers will transfer to local elevators starting from the plaza floors rather than all from the first floor, the present practice in skyscrapers.

The code insists upon fireproof elevator shaft enclosures and fireproof housing for the elevator machinery so that elevator evacuation of a fire-swept skyscraper will be possible.

Although the framers of the code found that present safety devices would permit safe elevator operation at any speed, it is believed that the limit of speed will not go much beyond 1200 feet per minute because of the discomfort to passengers resulting from rapid change in air pressures in ascent or descent.

Any speed above 700 feet per minute requires automatic operation with automatic floor leveling devices because of the difficulty of stopping more rapidly moving cars at floor levels. It was also found that at speeds of over 800 feet per minute an operator could not read floor numbers four feet high.

The code also includes provisions for the safe operation of freight and other types of elevators, the passenger-operated lifts, escalators, and dumbwaiters.

The following organizations are officially represented on the committee: American Hotel Association of U. S. and Canada, American Institute of Architects, American Institute of Electrical Engineers, American Society of Safety Engineers-Engineering Section, American Society of Mechanical Engineers, National Safety Council, Association of Governmental Officials in Industry of the U. S. and Canada, Elevator Manufacturers Association of New York, Elevator Manufacturers Association of the United States, International Association of Fire Engineers, International Association of Industrial Accident Boards and Commissions, National Association of Mutual Casualty Companies, National Bureau of Casualty and Surety Underwriters, National Electrical Manufacturers Association, National Fire Protection Association, National Industrial Conference Board, Retail Dry Goods Association, Society of Terminal Engineers, Underwriters' Laboratories, Inc., U. S. Department of Commerce-Bureau of Standards, U. S. Department of Labor, U. S. Treasury Department.

Copies of the code may be ordered from ASA at one dollar each.

[1] For description of development of code see p. 3.

Australian Body Publishes Building Classification

The Standards Association of Australia has just issued its *Standard Classification for Building Materials and Equipment* under the serial designation of Simplified Practice Recommendation R.2–1931. This classification is based on the one prepared in this country by the American Institute of Architects, modified somewhat as to nomenclature to meet Australian conditions. It establishes 41 basic divisions; such as, Section 1—preparation of sites; Section 2—excavation; Section 3—masonry materials. Each main section is subdivided and many of these subdivisions are in turn divided, making three indices in all.

In the introduction it is stated that the standard was adopted:

> "to insure the efficient use of the recorded experiences of architects, engineers, and builders, as published in reports of research and tests, in reports of Government Departments and standardizing bodies, and in manufacturers' articles and advertising matter in trade journals and the general press. . . . Study revealed that very great complexity had been forced upon those dealing with modern construction, for, with the whole world as a buying market from which to select materials and devices to be fabricated into buildings, a huge mass of descriptive matter became available from time to time with which architects, engineers, and builders should keep themselves in touch.
>
> "In addition to insuring their familiarity with the experiences of others, designers must also have information before them with regard to new materials and the probable service value of new equipment. Only in this way can they be in a position to judge and compare the relative merits of competing products, and be able to take advantage of standard tests."

Any one interested in reviewing the standard may borrow a copy from the ASA Information Service.

New York State Issues Specifications for Paint

Recently circulated New York State Specifications covering white lead, red lead, linseed oils, and turpentine are available through the ASA office. Illustrative of the data included in these specifications is that covering red lead paste, which states that this paste shall be

> "a good bright color and the pigments shall consist entirely of oxide of lead. The specified grade of dry pigment (85 per cent to 95 per cent grade) shall be thoroughly ground with pure raw or refined linseed oil. It shall be free from vitrified particles, metallic lead, and adulterants. Not more than 1.5 per cent of the residue shall remain after screening through a standard No. 325 screen. Moisture and other volatile matter shall not exceed one-half of one per cent (0.5 per cent). The paste as shipped and for three months thereafter shall not cake in the container and shall be readily broken up in oil to form a smooth paint of brushing consistency. The paste shall contain not more than 98 per cent nor less than 94 per cent of pigment and not more than 8 per cent nor less than 6 per cent of linseed oil. The grade of dry pigment used shall be not less than 85 per cent or 95 per cent true red lead (Pb_3O_4) as specified and the remainder shall be Lead Monoxide (PbO)."

Difficulty Follows Failure to Standardize Dress Sizes

The retail garment trade has been continually in difficulties because of the inconsistent and unstandardized size designations which are used for women's clothes. Different sets of designations are used for identical sizes and, worse still, sizes intended to be established according to the same system are often not so, because the manufacturers have agreed upon no uniform basis for the measurement of the wearer. In fact, it has been stated that the size series adopted by some makers has depended entirely upon the dimensions of some particular model who happened at the time to be in their employ. An interesting confirmation of the difficulties often reported in these columns, occasioned by lack of standards or the existence of confusing standards, is seen in the following from the *Women's Wear Daily:*

> "Some in the dress wholesale market made another point also; namely, that adoption of a standard of sizes would deprive the retailer of his best excuse for returning dresses. If the claim that a dress was sized wrong could be met and refuted by production of a tape measure, some manufacturers held, there would be far fewer returns—at least, suggested some of the more cynical, until another blanket excuse was evolved by the stores."